REPORT TO U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF WASTE PROGRAMS ENFORCEMENT

REMEDIAL INVESTIGATION
PART 1
SAMPLING PLAN

MONTROSE CHEMICAL SITE
LOS ANGELES, CALIFORNIA

May 1985

Prepared by

METCALF & EDDY, INC.

for

GCA TECHNOLOGY DIVISION

EPA Contract No. 68-01-6769
GCA Subcontract No. 1-625-999-222-02

Metcalf & Eddy | Engineers

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INVESTIGATION OBJECTIVES

The objectives of this sampling plan for the Montrose Chemical Facility are (1) to determine the extent of soil contamination at the site; (2) to determine if groundwater has been contaminated as a result of operations at the site; (3) to provide a data base for Feasibility Study evaluation of alternatives and endangerment assessment; (4) to determine what analytes should be included for analysis in the Part 2 Sampling Plan; (5) to perform sampling activities that are limited to those necessary and sufficient to meet the stated objectives; and (6) to provide guidance and coordination for all field work and site activities.

This Part 1 Remedial Investigation Samping Plan is focused on soil and groundwater sampling efforts onsite, and groundwater sampling efforts in a 1-mile radius of the site. The site characterization data obtained in Part 1 will be used in the Feasibilty Study work effort and will be used to focus Part 2 sampling efforts to the minimum necessary and sufficient to complete the Remedial Investigation/Feasibility Study. The analytes of interest or target chemicals for Part 2 will focus on soil sampling efforts onsite, further groundwater sampling effort if required, offsite soil, sediment, and surface water sampling to meet the objectives of the investigation.

SITE BACKGROUND

Site Description

The Montrose Chemical Co. site is located on Normandie Avenue in the "strip" of Los Angeles City and unincorporated land that separates the cities of Torrance and Carson (Figure 1).

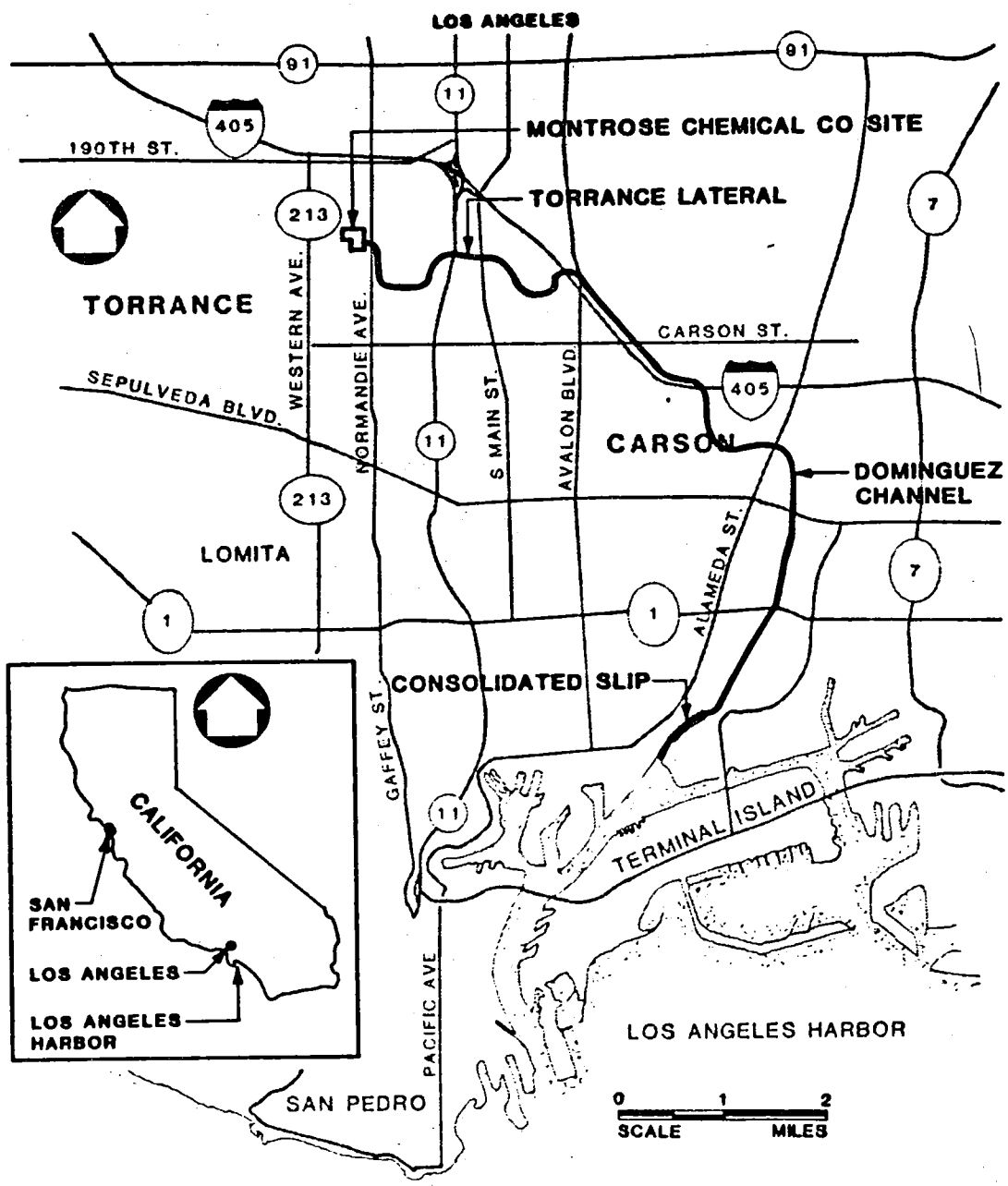


FIGURE 1. LOCATION MAP - MONTROSE FACILITY SITE

The 13-acre site is located in a light-industrial/residential area with about 3,000 people living or working within a quarter mile of the property. McDonnell Douglas property borders the Montrose site on the north and west and Jones Chemical Co. and Farmer Brothers Coffee Co. are located to the south (Figure 2). Railroad tracks operated by the Southern Pacific Transportation Co. surround the site on the north, east, and south. Los Angeles Department of Water & Power has a 100-ft wide easement that separates Montrose and Jones from Farmer Brothers Coffee and the nearest residences. The easement contains above- and below-ground utilities, with a power substation southwest of Jones Chemical.

The Jones Chemical Co. manufactures sodium hypochlorite. The Jones Chemical operations are not expected to impact the sampling activities or analyses.

The Los Angeles County Sanitation District has a 20-ft wide easement and right-of-way on the eastern edge of the property. The easement contains two sewer pipes of 57-in. and 66-in. diameter.

The Montrose site was used from 1947 to 1982 for manufacture of the pesticide DDT. The company's operations included formulation, grinding, packaging, and distribution of DDT. Soil and stormwater runoff samples have indicated DDT contamination both on- and off-site. Due to its toxic effects on wildlife and its persistence in the environment, DDT was banned in the United States in 1972, and the USEPA now considers it a Priority Pollutant. Montrose Chemical recently stopped producing DDT, demolished the manufacturing facility, and now proposes to redevelop the site into a warehouse facility.

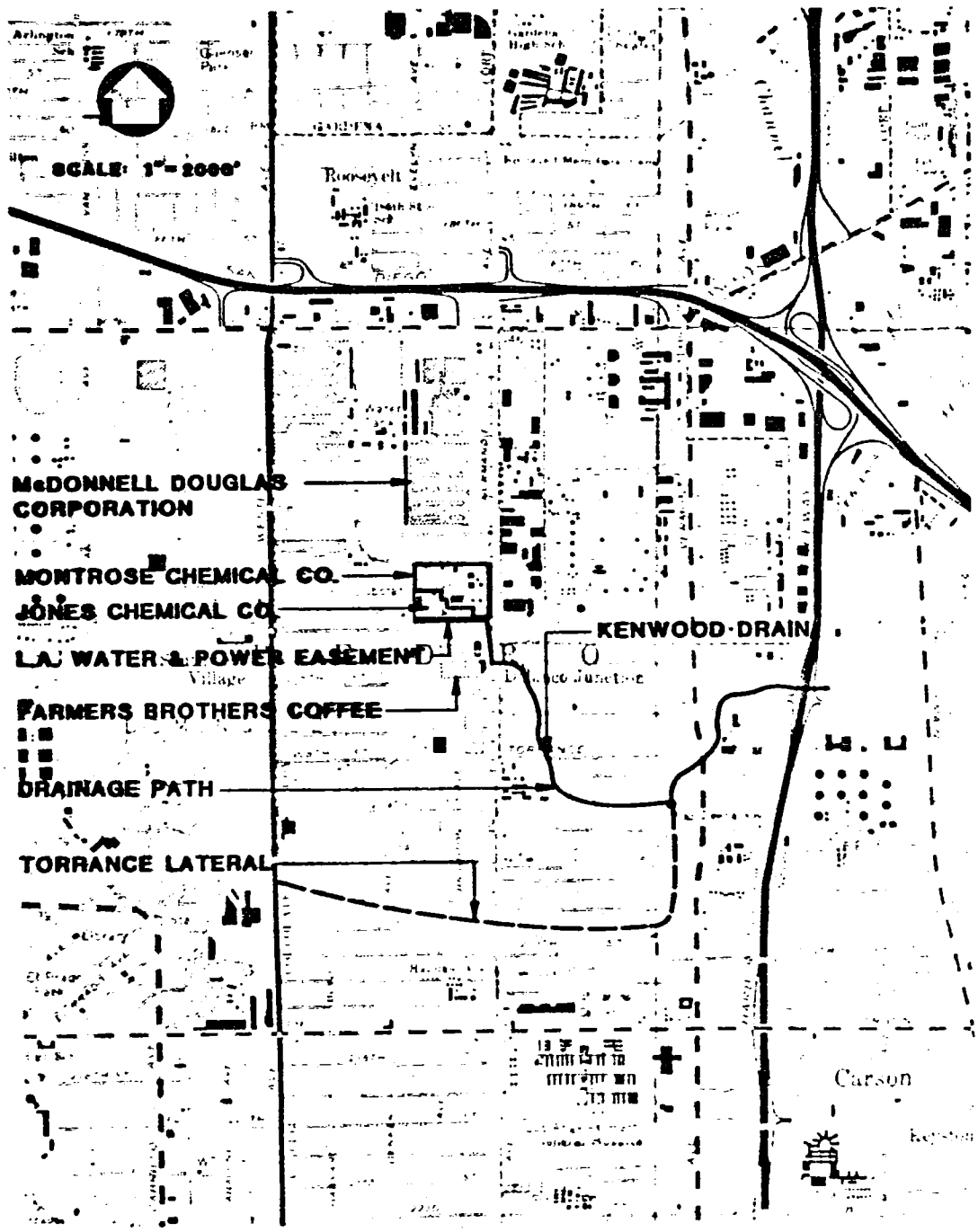


FIGURE 2. VICINITY MAP – MONTROSE FACILITY SITE

Montrose Chemical's sampling results showed onsite soils containing 300 to 400 tons of DDT, with surface soils exceeding California's hazardous waste criteria by two to five orders of magnitude. In 1982, a USEPA investigation found DDT in surface water runoff and sediments leaving the Montrose property.

Numerous studies show unusually high DDT concentrations in fish, shellfish, and sediments in the Los Angeles harbor and Dominguez Channel. High concentrations of DDT have been identified in sewers which received Montrose wastes before 1972.

Surface water flows south from the Montrose property through an unlined ditch to a catchbasin on Farmers Brothers property, through the Kenwood Avenue storm sewer to Torrance Lateral, to Dominguez Channel, to Consolidated Slip, and finally to the Los Angeles Harbor (Figures 1 and 2). Studies indicate that grinding of DDT at Montrose may have resulted in aerial dispersion of DDT throughout the surrounding area.

As a result of the 1982 investigation, both USEPA and the California Regional Water Quality Control Board issued enforcement orders in May 1983 to Montrose Chemical requiring (1) prevention of DDT releases from the site, (2) sampling of soils and surface water, and (3) design and implementation of remedial action. In response, Montrose built a berm intended to prevent stormwater runoff from leaving the property, presented results of a soil sampling program, and submitted its property redevelopment plans showing pavement covering most of the site. USEPA reviewed the redevelopment plans and accepted comments from the public, state, and local agencies in January 1984.

USEPA reevaluated the Montrose contamination problem based not only on comments and concerns received during the public hearing, but also on newly developed USEPA guidance documents for implementing Remedial Investigations and Feasibility Studies. As a result of the reevaluation, the site became subject to the

formal Remedial Investigation/Feasibility Study process and was proposed for addition onto the National Priority List of hazardous waste sites. A Remedial Investigation/Feasibility Study Work Plan has been prepared and approved (October 1984). USEPA is pursuing this Enforcement Remedial Investigation since the Responsible Party did not submit an acceptable Sampling Plan, Quality Assurance Project Plan, or Health and Safety Plan.

Most of the site was paved in January and February 1985 by Montrose Chemical. The site is flat.

Site conditions that may affect the sampling effort are weather and buried debris. The mean annual temperature in Torrance is 61.5 ^{o}F. Typical summer high temperatures are in the 90 ^{o}F range and low temperatures are around 55 ^{o}F. During winter, the temperatures typically range between a low of 48 ^{o}F and a high of 70 ^{o}F. Hot summer days will require special attention, as described in the Health and Safety Plan, to prevent worker heat stress. Air pollution episodes may require work stoppages if a warning stage is in effect. Buried concrete blocks several feet square were observed during the interim cap grading operations. Should such blocks be encountered while drilling monitoring wells or soil borings, the sampling location would need to be shifted 6 to 10 feet and recommenced.

Contamination Sources

The primary source of DDT contamination is the Montrose Chemical manufacturing operation conducted at the site from 1947 to 1982. Earlier industrial use of the site is indicated by examination of the historical photo search, but no further information is yet available. Montrose Chemical activities representing contamination sources include grinding of DDT, storage of liquid in a waste pond, piles of waste debris, and possible spillage of materials during operation at the site. Soil concentrations of DDT from sampling conducted by Montrose

Chemical in 1983 indicate values from a few parts per million to 10% DDT in the upper 3 feet of soil. The highest values were noted in the northwest and central portions of the site. The grading operation since the 1983 samples were taken is likely to have significantly redistributed the DDT in the soils at the site. Due to blending effects, lower maximum DDT concentrations are expected.

Contamination of the groundwater by DDT is not expected since DDT has a low solubility in water and is attracted to the organic fraction of soils. The 1983 soil sampling effort did indicate a rapid dropoff of DDT concentration with depth. DDT can be mobilized in the soil, however, if organic liquids have been spilled at the site. Groundwater is located at least 70 feet below grade. Monochlorobenzene (MCB) used at the site can mobilize DDT. Chlorobenzene sulfonic acid (CBSA) is mobile in soils and has been found in association with MCB. The appearance of Dioxin also is associated with MCB levels above 1 part per billion. Concentrations of these contaminants, if found, would be low.

The groundwater in the shallow aquifer may possibly be contaminated from another hazardous waste site in the area, the Del Amo site. Groundwater samples for the Del Amo investigation have contained significant amounts of the contaminants shown in Table 1. The values shown are the highest noted.

The flow of groundwater in the area is generally southeast from the Montrose site toward Del Amo, so it is not likely these constituents would be found in the groundwater beneath the Montrose site. However, it is possible since the hydraulic gradient is very slight and flow reversal can occur depending on groundwater extraction or recharge practices.

Table 1. SHALLOW GROUNDWATER CONCENTRATIONS AT DEL AMO
Concentrations in ppb

Contaminant	Concentration
Benzene	750,000
Toluene	2,600
Ethylbenzene	4,000
Chloroethane	0.9
Methylene chloride	1.8
Chloroform	2.5
Chlorobenzene	0.4
Napthalene	42
Nitrophenol	26
Phenol	810

Other contamination sources possibly influencing offsite concentrations of contaminants and air and surface drainage transport pathways will be examined in the Part 2 Sampling Plan.

Information Sources

Sources of information referenced to date are listed in Appendix A. Existing groundwater quality data sources do not record DDT information and the extent of soil contamination is not known. Therefore, the sampling effort described in this plan will fill these data gaps.

Reported Environmental Effects

The effects observed to date have been reported in (1) the CERCLA Investigation Report, April 11, 1983, Report No. C(83)E002, Steven Simanonok, USEPA; (2) Review of Proposed Response to USEPA Enforcement Order No. 83-01, November 1983, Metcalf & Eddy, Inc.; (3) Ambient Water Quality Criteria for DDT, October 1980, USEPA 440/5-80-038, USEPA. There are also numerous reports by the Southern California Coastal Water Research Project that have measured DDT and other contaminants in ocean waters and wildlife.

DDT generated at the plant was a granular or powdered product. DDT as formulated is white in color; technical DDT is a cream color and, as DDT decomposes, it can turn black. White discoloration of the surface drainage ditch has been observed as well as black granules along the western edge of the site.

A strong odor was observed downwind (but not upwind) of the site during grading operations in January 1985. The odor was described by observers as like pungent almond essence, like solvent, or like chemical laboratory solvent. The odors were noted along the western edge and along the central to east northern edge of the property. The chemical origin of the odor on the site is not known.

ANALYSIS OF EXISTING DATA

Review of existing groundwater data indicates that most of the analytes of interest were not included in routine analyses. Due to this insufficiency, groundwater samples must be obtained and analyzed. Also, most of the well data are for the deeper, Lynwood and Silverado aquifers rather than the shallow semiperched and Gage aquifers. Existing data from the Department of Water Resources and Los Angeles County Flood Control District will be examined to compare on a general basis with data being obtained.

Existing onsite soil data generated by Montrose Chemical Company is useful in a general way indicating possible ranges of DDT concentrations to be found on the site and approximate locations prior to January 1985 grading. However, the data do not meet the validity criteria to be able to be used in the Remedial Investigation/Feasibility Study decision process. The identity of sampling teams, collection technique, and field preparation technique have not been provided. The data are also not sufficient since only DDT was determined. The other analytes of interest were not measured. Due to these limitations, soil samples must be obtained and analyzed.

ANALYTES OF INTEREST

The analytes of interest for soil and water samples include (1) DDT and all its isomers; (2) known raw materials used in production of DDT shown in Table 2 (including MCB); (3) other constitutents of technical DDT shown in Table 3; (4) Dioxin compounds often found with MCB; (5) metals; and (6) cyanide. DDT isomers, technical DDT constituents, and raw materials are included in this list because these are known pollutants used onsite. DDT soil sampling indicates low and medium level contamination on the entire site; therefore it is likely that the other materials used at the facility also may have contaminated the entire area. For complete characterization of these compounds and byproducts, the National Contract Laboratory procedures for organic priority pollutant analyses for pesticides, volatile, and semivolatile organic compounds will be conducted. Dioxin is also often present in soils when MCB is found in concentrations greater than 1 part per billion.

Table 2. RAW MATERIALS USED IN DDT MANUFACTURING PROCESS[a]

Ammonium and sodium lignin sulfonates (Orzan)
Amorphous silicon dioxide hydrated (Hi-Sil 233)
Calcium silicate synthetic (Micro-Cel E)
Calcium sulfate dihydrate (industrial ground gypsum)
Chloral (trichloroethanal)
Magnesium silicate hydrate (talc)
Monochlorobenzene (MCB)
Oleum - 65% (fuming sulfuric acid)
Sodium-N-methyl-N-oleoyl taurate (Igepon T-77)
Sulfonated lignin (Reax 45A)
Sodium hydroxide - 50% solution

a. Submitted to California Department of Health Services by Montrose Chemical Corporation, May 1981.

Table 3. APPROXIMATE COMPOSITION OF TECHNICAL DDT

Compound	Approximate percentage
1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane(p,p'-DDT)	63-77
1,1,1-trichloro-2-(o-chlorophenly-2-(p-chlorophenyl) ethane (o,p'-DDT)	8-21
1,1-dichloro-2,2-bis(p-chlorophenyl)ethane (p,p'-TDE)	0.3-4.0
1,1-dichloro-2-(o-chlorophenyl)-2-(p-chlorophenyl) ethane (o,p'_TDE)	0.04
1,o-chlorophenlethyl-2-trichloro-p-chlorobenzene sulfonate	0.1-1.9
2-trichloro-1-p-chlorophenylethanol	0.2
Bis(p-chlorophenyl)sulfone	0.03-0.6
a-chloro-a-p-chlorophenylacetamide	0.01
a-chloro-a-o-chlorophenylacetamide	0.01
Chlorobenzene	0.3
p-dichlorobenzene	0.1
1,1,1,2-tetrachloro-2-(p-chlorophenyl)ethane	Present
Sodium p-chlorobenzene sulfonate	0.02
Ammonium p-chlorobenzene sulfonate	0.01
Inorganic	0.01-0.1
Unidentified and losses	5.1-10.6

Sources:
1. Ottinger, et al. Recommended Methods of Reduction Neutralization, Recovery, or Disposal of Hazardous Waste - Volume V. 1973.
2. Berger, Louis & Associates. Draft Environmental Impact Statement for the Safe Collection, Transportation, and Final Disposal of U.S. Dept. of Defense Stocks of DDT. Defense Logistics Agency. June 1980.

Inorganic metals analysis for some soil and water samples is required since insufficient information is available regarding earlier industrial use of the site. The metals analysis will indicate if elements are present in significant concentrations that should be considered in developing remedial action alternatives. The cyanide analysis is warranted due to the pungent odor observed during grading activities and is obtained at no additional cost. An almond essence as reported by one observer is characteristic of cyanide compounds.

All these priority pollutant analyses are to be performed on both soil and groundwater samples to determine whether transport of the compounds through the soil to the aquifer has occurred.

Other soil analyses called for in the Remedial Investigation/ Feasibility Study Work Plan are for total organic carbon (TOC) and grain size. The TOC measurement can be used with reported values of adsorption coefficient K_{OC} for DDT transport in soils and sediments. The relationship is shown in the following equation*:

$$K_{OC} = (\text{ug adsorbed/g total organic carbon})/(\text{ug/mL solution})$$

These data are necessary for the Feasibility Study evaluation. The grain size analysis will be performed on selected soil samples to further aid in identifying soils and possible sediment transport characteristics of DDT contaminated soils.

Other water analyses included in the sampling plan are chlorobenzene sulfonic acid (CBSA), total dissolved solids (TDS), calcium, nitrate, nitrite, sulfate, bicarbonate, chloride,

*Source: Lyman, Warren J. et al. Adsorption Coefficient for Soils and Sediments, Handbook of Chemical Property Estimation Methods - Environmental Behavior of Organic Compounds. McGraw-Hill Book Company.

fluoride, and carbonate. CBSA will be analyzed in accordance with the special protocol for water samples included as Appendix B. Work at other USEPA hazardous waste enforcement sites containing MCB has determined that CBSA is mobile in soil and often present with MCB. It is requested the CBSA special analytical services be performed by Science Applications International Corporation (SAIC) which has performed this analysis for investigations at the Stringfellow hazardous waste site. SAIC is specifically requested because of its familiarity with the procedure. The remaining constituents for analysis are included to define the aquifer. The information will be useful in identifying the aquifer and establishing potential uses of the aquifer.

SAMPLE LOCATIONS AND TYPES

Two types of samples are to be collected: soil and water samples. The planned sampling for the soil boring, hydrogeologic and groundwater activities are described in this section.

Onsite Soil Sampling - Work Plan Task 13

To determine the extent of soil contamination, one boring will be made in the center of each onsite quadrant D or partial quadrant D, a total of 18 sample locations. Quadrant D was chosen over Quadrant B as stated in the Remedial Investigation/Feasibility Study work plan since this has the least interference with intended monitoring well locations. The boring locations are shown in Figure 3. Sampling will be continuous for the 10 feet to determine the soil lithology. In addition, samples are designated for analysis above and below stratum changes and at the following six depths: 0-6 in. (ground surface), 2 ft, 4 ft, 6 ft, 8 ft, and 10 ft. Actual samples selected for analysis will be $\pm$6 inches from the depth indicated. Samples taken at stratum changes will be analyzed for DDT, TOC, and aromatics only.

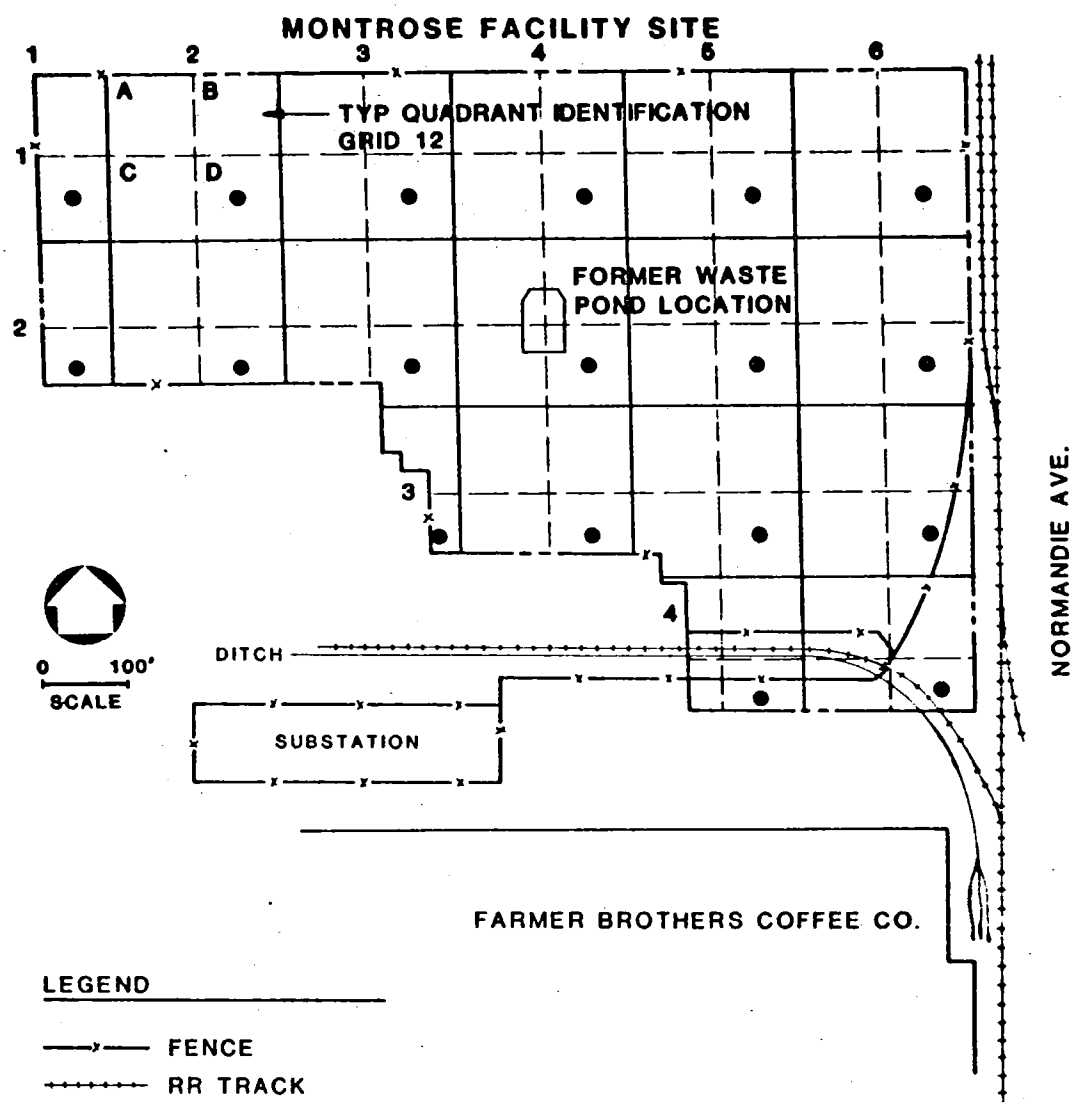


FIGURE 3. ONSITE SOIL SAMPLING LOCATIONS

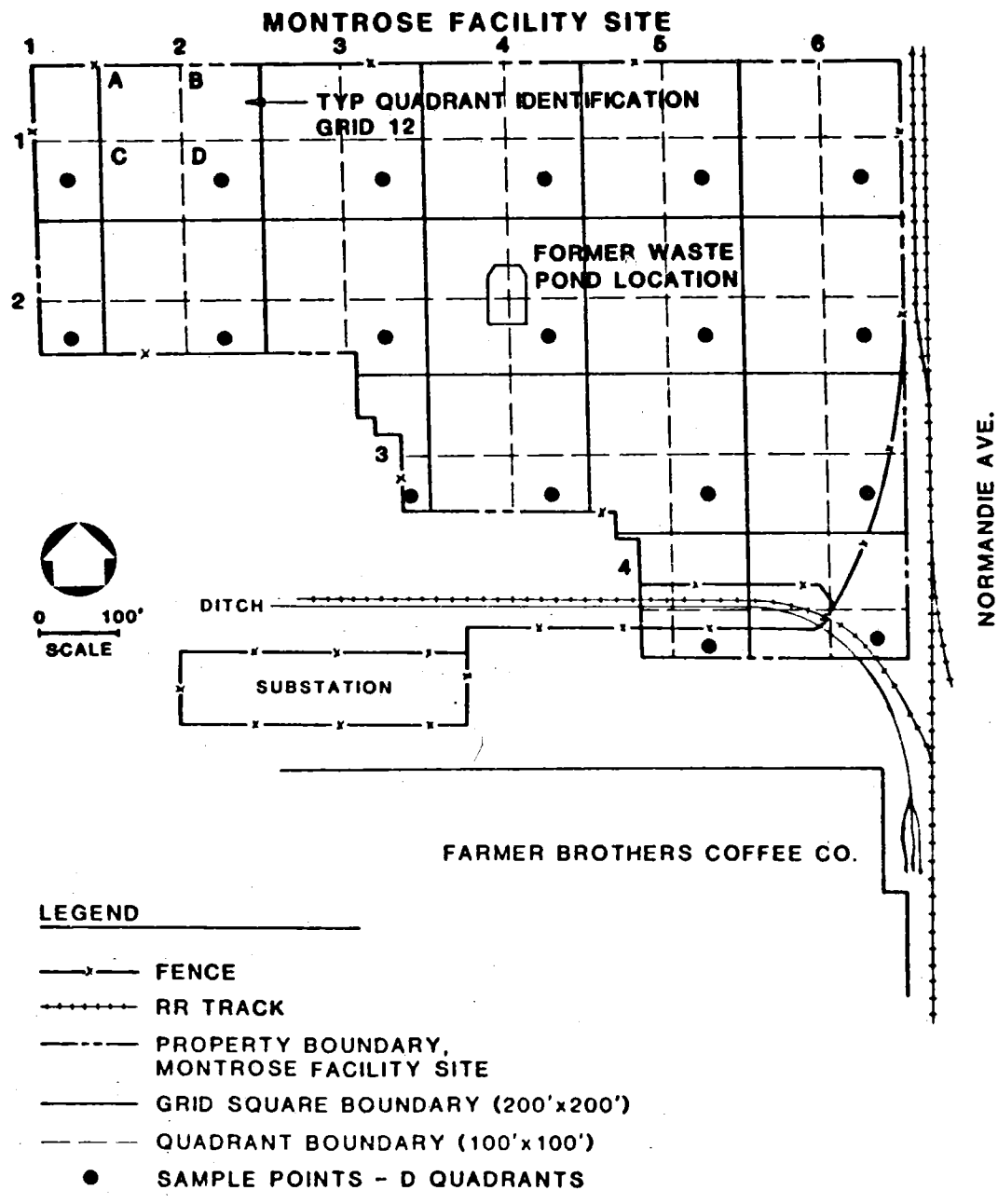


FIGURE 3. ONSITE SOIL SAMPLING LOCATIONS

The extra samples which are not analyzed will be frozen and stored for up to 3 months.

Duplicates will be selected from immediately prior or next successive sample tube at the field geologist's discretion. The most undisturbed sample will be given preference for analysis where a choice exists. Duplicates, if possible, will be selected around special samples as noted by unusual color or appearance.

A grid arrangement of the soil samples was chosen since the site was graded, mixing the soils. Previous soil sampling efforts therefore cannot be used as a guide to establishing any other configuration of sample locations. Without any other logical basis, a grid is a systematic approach.

All 4-ft and 10-ft depth soil samples will be analyzed for priority pollutants (volatile and semivolatile organics, pesticides, metals, and cyanide analyses) according to standard USEPA protocols by the National Contract Laboratory Program (NCLP) and as noted in the QAPP. These samples are necessary to define the extent of soil contamination, the first objective of this sampling plan. Inorganic analyses are to be split from the sample tube by the laboratory. A 7-day turnaround is requested to send the sample to the laboratory that will do the inorganics analysis to minimize delay in obtaining sampling results.

All 0-6 in. 2-ft, 6-ft, and 8-ft depth samples will be analyzed for DDT and isomers, chlorinated aromatics, and TOC. These depths are not having the full priority pollutant scan to reduce costs and accommodate NCLP analysis capacity.

To better characterize soil characteristics, three locations will be chosen for grain size analysis of soils at three depths. These nine samples will undergo complete grain size analysis but will not be analyzed for pollutants due to the rigors of the grain size analysis potentially altering the chemical constituents.

Where distinct layers of different colors or textures are present, separate samples will be taken and analyzed. For instance, where a brown sandy clay contains yellow and white streaks, three separate samples should be analyzed: one of the brown sandy clay, one of the white material alone, and one of the yellow material alone. It is estimated that a minimum of six soil types will be characterized. Should any of the soil samples be white or otherwise suspected of being DDT, the sample will be marked as a medium hazard sample and subject to the full pollutant analyses. If more than two of such samples are encountered, the EPA Contract Laboratory Coordinator (Laura Tom) will be contacted to determine any further actions.

If the analytical results for any soil samples indicate levels of MCB above 1 ppb, then up to five of the indicated samples will be resubmitted for Dioxin analysis. Should more than five samples indicate MCB levels above 1 ppb, then the selected samples will be the five highest concentration at the greatest depth.

All samples will have their lithology described, be labeled, and handled according to procedures outlined in the Analytical Procedures Section of this plan. Portable organic vapor analysis equipment will be used to scan all soil samples in the field as they are collected. Any soil samples that give a positive HNu indication above background levels will be considered for USEPA Priority Pollutant analysis. All samples will be obtained by split spoon sampling technique. Each boring hole is to be completed in 1 day. To avoid possible contamination, no partially finished holes will be left.

The soil debris and crushed rock pile sampling mentioned in the Remedial Investigation/Feasibility Study Work Plan will not be conducted since the piles no longer exist. During the interim cap grading, some debris was hauled from the site and the crushed rock pile was distributed over the site for roadway or building

support and then paved with asphalt. These materials, since they are present in the soils, will appear in the soil boring activity.

Hydrogeologic Investigation - Work Plan Task 11

To determine if chemicals have migrated from the Montrose site to the groundwater system, soil and groundwater below the main water table and any perched water bodies that may exist above it will be evaluated.

The Montrose Facility Site is located on the coastal plain in a groundwater basin known as the west plain (Poland, Garrett, and Sinnott, 1959) or the west coast basin (State of California Department of Water Resources, 1961). The basin consists of a series of aquifers which are listed below as they reportedly occur in the vicinity of the site.

Formation names	Aquifer names	Approximate aquifer elevation (datum MSL)
Lakewood Formation (Terrace Cover, Palos Verdes Sand, unnamed Upper Pleistocene deposits)	"Semi-perched" aquifer	-30 to ?
	Gage aquifer	-80 to -130
San Pedros Formation	Lynwood aquifer	-200 to -325
	Silverado aquifer	-450 to -650

A review of water level data suggests that the main water at the site occurs at a depth of about 70 feet and may be located in the "semi-perched" aquifer. The exact depth of the borings and the wells will be determined in the field during the investigation. It is estimated the wells will from 70 to 100 feet deep.

Five wells have been installed without USEPA approval at the site by Montrose Chemical Company. If the construction and depth of these wells proves acceptable to USEPA, then they will be used to

obtain onsite groundwater samples. The installation of additional wells or deep soil borings by USEPA to (1) provide hydrogeologic data regarding the movement of water in the unsaturated and saturated zones, and (2) to provide soil samples for chemical analyses has been postponed. The well installation and soil sampling procedures have been removed from this section of the Sampling Plan and placed in Appendix F. USEPA may choose to amend this plan and reincorporate all or part of the provisions in Appendix F depending on (1) the information obtained about the Montose Chemical wells, (2) the sampling results from this USEPA Part 1 Sampling Plan, and (3) the availability of NCLP for sample analyses.

Table 4 summarizes all soil sampling to be conducted during the soil boring and hydrogeologic investigations in Part 1 of the Remedial Investigation. Appendix C contains the NCLP forms to be submitted for all samples being taken in the Part 1 investigation.

Duplicates are included for 10% of the samples taken in a day or one per day minimum. Six samples will be taken at least 10 miles from the site in direction(s) least often downwind of the Montrose site as determined from nearby airport wind roses and air monitoring data from grading activities should those data become available. These samples will be used to determine possible background DDT levels.

Table 4. REMEDIAL INVESTIGATION PART 1 SOIL SAMPLING SUMMARY

Location Grid No.	Total number samples 6-in. tubes	No. of samples for analysis at 0-10 ft depth[b]	Type of analysis[a] RAS	SAS1	Dioxin	SAS2
11D	20	6	2	4	--	--
12D	20	6	2	4	--	--
13D	20	6	2	4	--	--
14D	20	6	2	4	--	--
15D	20	6	2	4	--	--
16D	20	6	2	4	--	--
21D	20	6	2	4	--	--
22D	20	6	2	4	--	--
23D	20	6	2	4	--	--
24D	20	6	2	4	5[d]	9[e]
25D	20	6	2	4	--	--
26D	20	6	2	4	--	--
33D	20	6	2	4	--	--
34D	20	6	2	4	--	--
35D	20	6	2	4	--	--
36D	20	6	2	4	--	--
45D	20	6	2	4	--	--
46D	20	6	2	4	--	--
Soil types[f]	--	6	6	--	--	--
Duplicates	--	20	10	10	--	--
Background	--	6	2	4	--	--
Total	360	140	54	86	5	9

a. Type of analysis: RAS = Routine Analytical Services for Full Priority Pollutants; Priority Pollutants consist of volatile and semivolatile organics, pesticides, metals, and cyanide analyses. SAS1 = Special Analytical Services for TOC, chlorinated aromatics, and DDT. SAS2 = Special Analytical Services for grain size analysis.
b. Two-ft interval.
c. Up to five samples may be submitted for Dioxin analysis if MCB levels are greater than 1 ppb.
e. Three locations at three depths will be analyzed for straight grain size analysis, no chemical analysis.
f. A minimum of six different soil types is assumed.

Surveying Requirements - Work Plan Task 10

Prior to initiation of sampling activities, a property survey will be conducted by a qualified surveyor to delineate and verify certain property lines of all properties adjacent to the site and also the Farmer Brothers Coffee Co. property. These property lines will be identified in the field and on a site base map and will be used in gaining access and right of entry for any subsequent subsurface investigations and/or monitoring purposes. A topographic survey will also be conducted in preparation of the site base map. The site base map will be used during the Remedial Investigation and implementation of remedial actions and for determining the horizontal and vertical locations of existing and proposed groundwater monitoring wells and soil borings.

Site topography will be mapped using aerial photography with ground control. Existing aerial photography conducted for Montrose Chemical reportedly exists and will be used if available. Horizontal and vertical ground control will be established as required by the aerial photography requirements. Field crews will establish and construct points which will be visible on the aerial photographs. A permanent benchmark for horizontal and vertical control will be established and tied to USGS mean sea level (MSL) datum.

The site will be flown, in suitable weather and visibility. Specific flight parameters such as speed, number of flight lines, photographic exposure interval, and flight altitude will be controlled by the photogrammetrist to provide for a proper and completely finished topographic map covering an area including the Montrose Facility site and all areas within 500 feet of the delineated site boundaries.

The topographic site base map will be a single, scribed, double matte, 3 mil washoff mylar with reversed image. The map will

have a horizontal scale of 1 inch = 100 feet and a contour interval of one foot. One offsite and four onsite temporary benchmarks should be established and located on the Site Base Map. A 200-foot square coordinate grid will be overlain on the map oriented to state coordinate system labeled with corresponding reference numbers and letters to allow easy identification of portions of the property and sample locations. Each 200-foot grid square will be subdivided into four equal-area quadrants. The grid will cover the entire mapped area, not just within the site boundaries. The 100-ft grid and 100-ft quadrant corner points will be marked with paint on the asphalt ground surface in the field.

All utilities and abutting property owners will be contacted to determine location, size, nature, and materials of underground piping, drains, catchbasins and other structures. These will be shown in plan view on the Site Base Map and, where necessary, in cross-section. This information will be used to prevent unnecessary damage during soil sampling and well installation.

Following the installation of groundwater monitoring wells, all wells will be surveyed and elevations will be established to an accuracy of 0.1 ft with respect to the temporary benchmarks (datum MSL) and drawn onto the Site Base Map. These elevations and locations are necessary to determine the hydrogeologic conditions beneath the site.

Groundwater Sampling - Work Plan Task 12

Onsite Sampling. The five onsite groundwater monitoring wells are to be sampled to determine if contaminants from the site have reached the aquifer. Prior to collecting the samples, three static well casing volumes of water will be pumped from each well. The purged water will be collected in drums and held onsite until appropriate disposal methods are determined by the USEPA. Sample collection, handling, preservation, labeling, and

chain-of-custody procedures in accordance with NCLP procedures will be followed. The samples obtained are to be analyzed for priority pollutants (volatile and semivolatile organics, pesticides, and metals), chlorobenzene sulfonic acid, total dissolved solids, calcium, chloride, nitrate, nitrite, bicarbonate, carbonate, sulfate, and fluoride. Field measurements of pH, temperature, and electrical conductivity will also be taken.

Offsite Sampling. Five existing offsite monitoring wells within a 1-mile radius of the site are to be sampled to determine if contamination has reached the groundwater and migrated offsite. The locations of wells in a 1-mile radius are shown in Figure 4. The chosen wells are indicated by filled-in symbols and are listed in Table 5. The Remedial Investigation/ Feasibility Study Work Plan stated all wells within a 1-mile radius were to be sampled, or three minimum. Due to the large number of wells, only the five most representative wells were chosen based on the screened depth of the well, nearness to the site, spatial location, and operational status. Wells judged to be in the same aquifer as the onsite monitoring wells are given first priority with nearness to the site second priority.

Operational wells are preferred over those where pumping or bailing will need to be provided. However, two nonoperational wells will be examined for possible sampling in order to obtain a spacial distribution. Permission from well owners will be obtained prior to sampling. The same sample analyses will be performed as for the onsite groundwater samples. Table 6 contains a summary of the water samples. Field measurements of pH, temperature, and electrical conductivity will be taken.

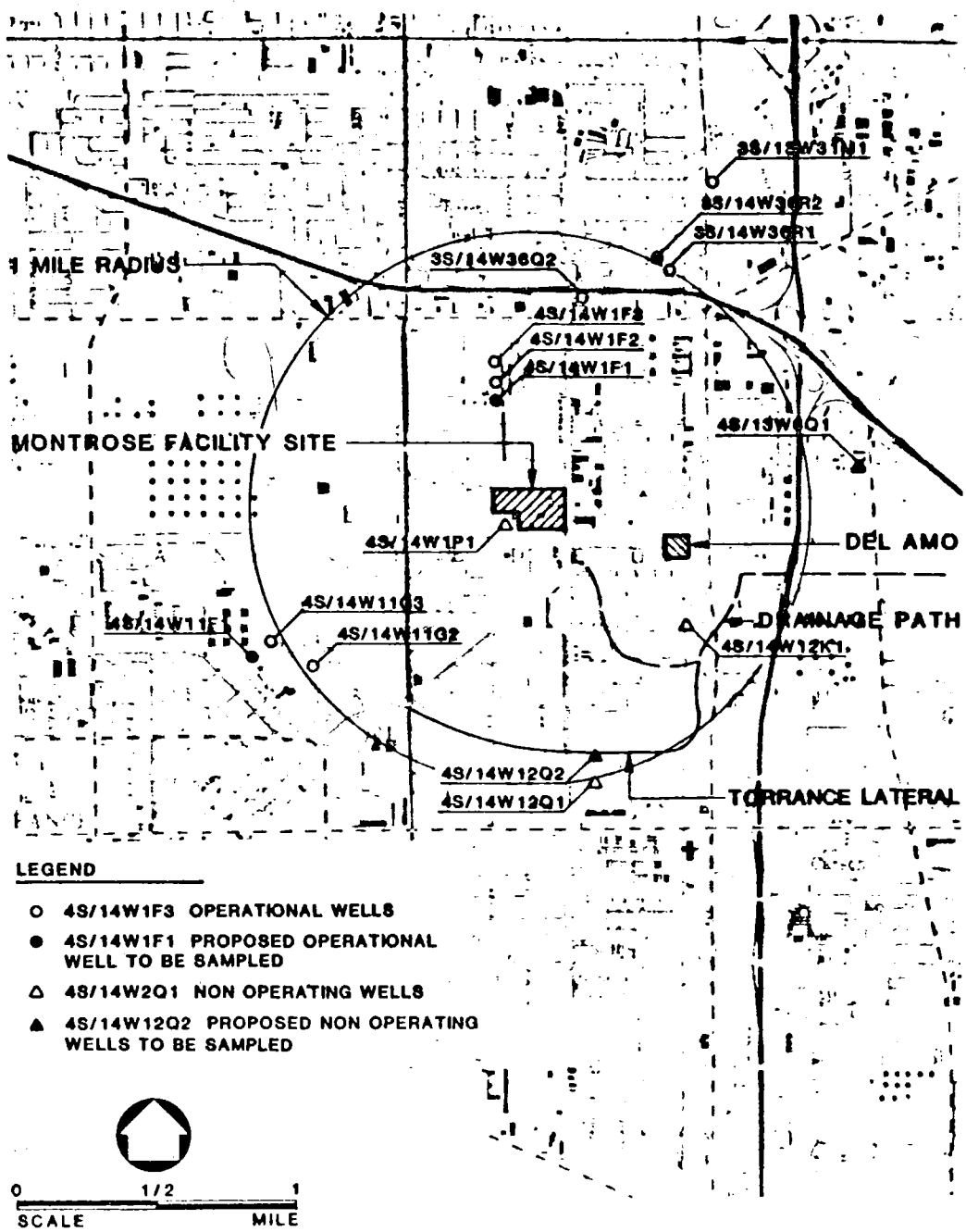


FIGURE 4. OFFSITE WELL LOCATIONS

Table 5. OFFSITE WELLS

State well No.	Sample No.	Well depth, ft	Screened range, ft	Owner
Operational wells				
3S/13W31M1	--	664	550-644	M.Zeigler
3S/14W36Q2	--	352	NA	J.Ramos
3S/14W35Q2	--	NA	NA	V.M.Wright
3S/14W36R1	--	254	NA	F.J.Easter
3S/14W36R2	36R2	70	NA	Bennett
4S/14W1F1	1F1	600	473-514	Aluminum Co.
4S/14W1F2	--	600	477-540	Aluminum Co.
4S/14W1F3	--	600	427-550	Aluminum Co.
4S/14W11F1	11F1	460	140-450	U.S.Steel Corp.
4S/14W11G2	--	613	293-598	Columbia Steel
4S/14W11G3	--	510	236-480	U.S.Steel Corp.
Nonoperational wells				
3S/14W35R1	--	NA	NA	So.Cal.Edison
4S/13W6Q1	6Q1	70	NA	Not listed
4S/14W1P1	--	727	486-714	Stauffer Chem.Co.
4S/14W12K1	--	100	NA	Frank Austin
4S/14W12Q1	--	377	NA	Carson Estate Co.
4S/14W12Q2	12Q2	165	NA	LACFCD

Well 4S/14W12K1 will be investigated as an alternate sampling location if either 4S/13W6Q1 or 4S/14W12Q2 prove impractical for sampling. It was not selected as the first or second choice because of its proximity to the Del Amo hazardous waste site. Some water quality information is already available from Del Amo site well(s).

Table 6. REMEDIAL INVESTIGATION PART 1 - GROUNDWATER SAMPLING[a]

Location	No. of samples	No. of duplicates	No. of blanks
Onsite Montrose wells			
MW1	1	-	1
MW2	1	-	-
MW3	1	1	-
MW4	1	-	-
MW5	1	1	1
Offsite wells			
OW1	1	1	-
OW2	1	-	-
OW3	1	-	1
OW4	1	-	1
OW5	1	1	-
Total	10	4	4

a. All samples are to be analyzed for Priority Pollutants, chlorobenzene sulfonic acid, TDS, chloride, sulfate, nitrate, nitrite, fluoride, calcium, carbonate, and bicarbonate.

ANALYTICAL PROCEDURES

The following procedures will be used onsite in obtaining all soil and water samples. All procedures are to be in accordance with the Quality Assurance Project Plan (QAPP) and the National Contract Laboratory Program (NCLP) procedures.

Soil Boring Sample Procedures

Mobilization. The drilling subcontractor selected by competitive bid must be capable of supplying a California split-spoon sampler and a 140-lb hammer for driving the sampler into the ground. Full technical specifications of required equipment are located in Appendix D.

Brass sampling tubes, aluminum foil, teflon caps, and electrical tape will be provided by Metcalf & Eddy. Other equipment required includes:

- Health and safety materials - see Health & Safety Plan checklist
- Century HNu
- Field notebooks (three)
- Drilling log, chain-of-custody, and sample label forms
- Sampling containers as specified by NCLP
- Markers and other labeling items
- Plastic bags
- Office trailer with desks (two) and chairs (four)
- Spray paint cans
- Polyvinyl sheet
- Camera and film
- Disposal drums, new 55-gal capacity (12 minimum)
- Decontamination equipment - see Health & Safety plan checklist

Prior to going onsite, the team leader will review and expand upon this list as required.

Cleaning. Drill rig shall have been steam cleaned prior to being brought onsite. Each length of hollow stem auger shall be cleaned by pressurized steam before commencing to drill at each soil boring site. Sampling tubes will be cleaned prior to use by TSP detergent wash, deionized water rinse, and certified organic-free water rinse.

Onsite Activities. Onsite activities will include:

- Review project objectives with all personnel and identify boring sites to be drilled each day.
- Review health and safety procedures with all personnel.
- Make background HNu measurements onsite every 3 hours. Record observations at at least three locations around the site: locations to be determined in field by Team Leader.
- Make daily record of weather conditions and site characteristics
- Place polyvinyl sheet down around borehole location and secure.
- Assemble sampler with brass tubes and drive it into the ground. Continuous sampling of 10 feet of soil will be performed at each boring location. Record the blow count on the driling log for each 6-in. interval.
- Retrieve the sample, open the spoon, remove samples, and decontaminate spoon prior to reuse.
- Take HNu measurements of each sample tube. Record reading and make visual observations as required in section Sample Types and Location. Note any difficulties in sampling including drilling behavior.
- Cap ends of brass tubes with aluminum foil and teflon end cap. Secure cap and foil with electrical tape.
- Label each tube and place in plastic bag. Mark top and bottom of sample tubes.
- Label each plastic bag.
- Complete chain-of-custody forms, seals, and traffic reports. See QAPP.
- Package groups of samples and ship via Federal Express to designated NCLP laboratory daily. Follow procedures for packing low and medium concentration samples as noted in QAPP.
- Clean split-spoon sampler by TSP detergent wash, water rinse, and deionized water rinse.
- Pressurize steam clean downhole drilling equipment.

- Remove waste soil materials and polyvinyl sheet.
- Abandon borehole by filling with a clean sand, bentonite mix.
- Place waste soil material from the first 5 feet of drilling in a separate drum from waste soil materials from below 5 feet of ground. Place waste soils from different boreholes in the same drum. Place polyvinyl sheet in the upper 5-ft interval designated drums. Label and handle drums in accordance with all hazardous waste state, federal, and local regulations and as specified in the Technical Specifications, Appendix D.

Monitoring Well Installation and Soil Sample Procedures

This activity has been postponed. The intended procedures are included in Appendix F for reference only.

Onsite Groundwater Sampling

Mobilization. The following equipment shall be available prior to sampling effort:

- Sample containers
- Ice chest(s)
- Ice
- Bladder pump and tubing (teflon and stainless steel construction)
- Wastewater drums - new 55-gal capacity
- pH meter
- Electrical conductivity/temperature probe
- Electrical water level probe
- Health and safety items - see Health & Safety Plan checklist
- Discharge hose, 25 ft
- Field notebook

- Bottles as specified in QAPP.
- Labeling markers, etc.
- Preservatives as noted in QAPP.

Cleaning. The sample containers shall have been properly cleaned and prepared with preservatives as appropriate by the NCLP laboratory. The bladder pump and tubing shall be cleaned with TSP detergent and rinsed with acetone, hexane, deionized water and certified organic-free water prior to going out to the field and between each well sampling effort. Ten gallons minimum of each rinsewater will be pumped through the tubing at each cleaning.

Onsite Activities. The following onsite activities shall be performed:

- Observe condition of steel protective casing and locked cap.
- Take water level measurement, electrical conductivity, pH, and water temperature.
- Calculate water volume in well.
- Using bladder pump, evacuate four well volumes.
- Place discharge water in waste drums.
- Take second set of measurements--water level, electrical conductivity, pH, and temperature.
- Collect water sample and put on ice. Fill out all appropriate labels and custody forms.
- Clean bladder pump, discharge tube, and probes.
- Package samples appropriately and send to designated NCLP laboratory daily. Follow procedures for packaging low and medium concentration samples as noted in QAPP.
- Relock cap on protective casing

Offsite Groundwater Sampling

Mobilization. The following equipment and activities shall be coordinated prior to sampling effort:

- Sample containers
- Ice chest(s)
- Ice
- Bladder pump and tubing (teflon and stainless steel construction)
- Wastewater drums - new 55-gal capacity
- pH meter
- Electrical conductivity/temperature probe
- Electrical water level probe
- Weighted tape
- Health and safety items - see Health & Safety Plan checklist
- Discharge hose, 25 ft
- Field notebook
- Labeling markers, etc.
- Obtain permission for access from well owner. Determine from owner if well is currently operational and other pertinent data.
- Obtain permission from owner to (or have owner's representative) operate pumps if pumps are installed but not operating.
- Inspect well to determine if sampling is feasible.
- For all field verified wells, examine records of well and determine well volume, depth, and probable water volume.
- Preservatives as noted in QAPP.
- Bottles as specified in QAPP.

Cleaning. The sample containers shall have been properly cleaned and prepared with preservatives as appropriate by the NCLP laboratory. The bladder pump and tubing shall be cleaned with TSP detergent and rinsed with acetone, hexane, deionized water and certified organic-free water prior to going out to the field and between each well sampling effort. Ten gallons minimum of each rinsewater will be pumped through the tubing at each cleaning.

Offsite Activities- Operational Wells.

- Obtain access to well.
- Observe condition of well. Photograph sampling location.
- Sound the well with weighted tape.
- If pump has been operational for a minimum of 30 minutes, obtain sample from discharge.
- If well has not been operational for 30 minutes, obtain water level measurement, calculate well water volume, pump four volumes from well, take sample, and turn off pump.
- Take water temperature, pH, and electrical conductivity measurement of sample.
- Put sample(s) on ice and fill out all appropriate labels and custody forms.
- Package samples appropriately and send to designated NCLP laboratory daily. Follow procedures for packing low and medium concentration samples as noted in QAPP.

Offsite Activities - Nonoperating Wells.

- Obtain access to well.
- Observe condition of well. Photograph sampling location and well area.
- Take water level measurement, electrical conductivity, and water temperature.
- Calculate water volume in well.
- Using bladder pump, evacuate four well volumes.

- Place discharge water in waste drums.
- Take second set of measurements--water level, electrical conductivity, and temperature.
- Collect water sample and put on ice. Fill out all appropriate labels and custody forms.
- Clean bladder pump, discharge tube, and probes.
- Package samples appropriately and send to designated NCLP laboratory daily. Follow procedures for packing low and medium concentration samples as noted in QAPP.
- Obtain permission to leave drum at well for up to 3 months with owner.
- Leave well area in same condition as found.

OPERATIONAL SCHEDULE

Agency Coordination

The USEPA Region IX has authorized the Enforcement Remedial Investigation of the Montrose Chemical Company site. The USEPA is obtaining access to the site for its subcontractor under the TES Contract. Metcalf & Eddy, under subcontract to GCA Technology (GCA) will perform sampling field activities and geological logging of the wells and soil borings. GCA will obtain a drilling subcontractor to work under M&E supervision. GCA field presence will only be required periodically to maintain cost control. The USEPA is also coordinating laboratory services through the National Contract Laboratory Program. The Community Relations Program activities will keep other interested agencies informed of the site activities and progress. USEPA will be responsible for removing hazardous waste drums from the site.

Field Team Organization and Responsibilities

The field team will be comprised of three individuals initially: the field team leader and one field staff personnel. Field team responsibilities are shown in Table 7.

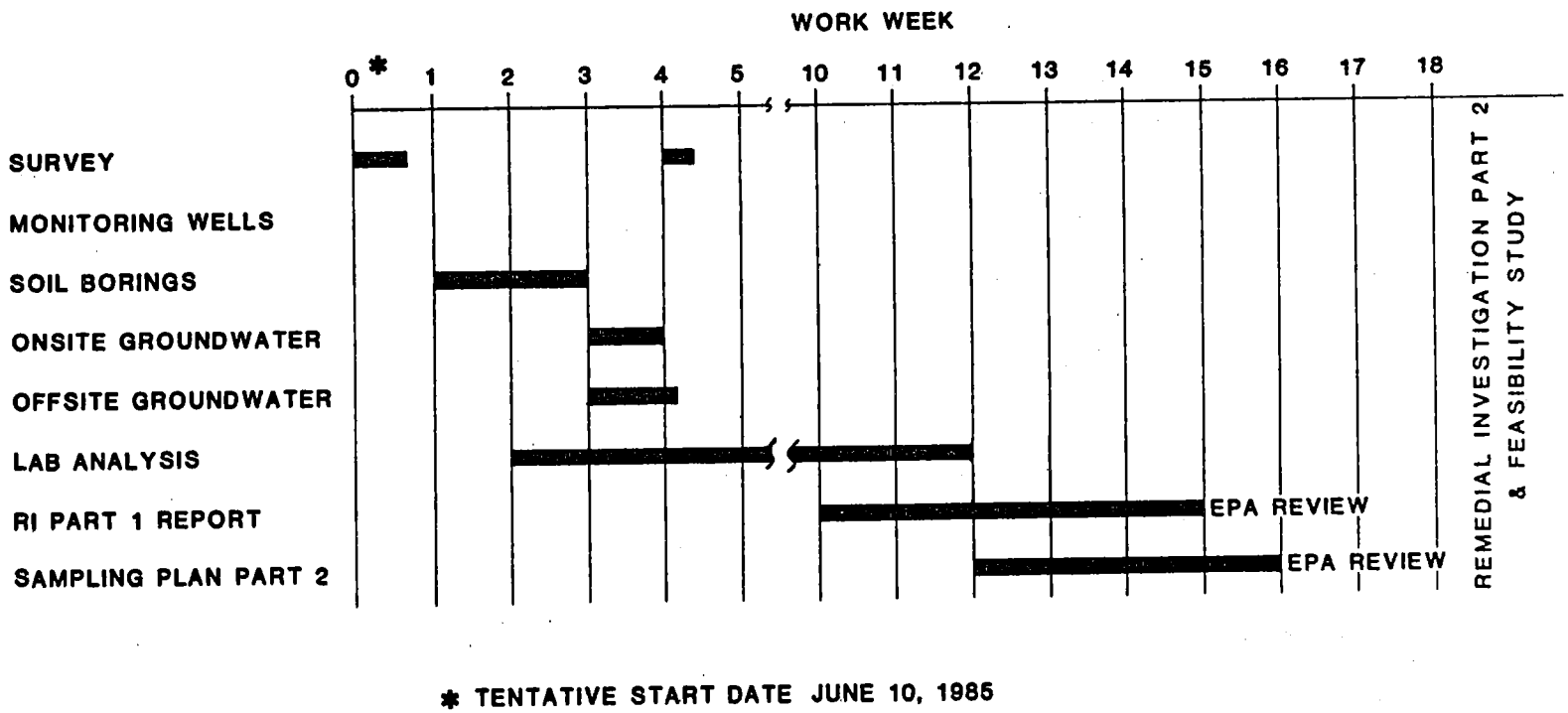
The team leader will be responsible for organizing all field activities and coordinating with the drilling subcontactor. The team leader will also function as the site health and safety officer and will have the duty of being the equipment custodian. The field staff will log the wells and borings and collect the samples and will have primary responsibility for seeing that all samples are properly logged, labeled, and shipped. The team leader can reassign the duties in the field if in his judgment it is better to do so. Once the soil boring activity is complete, the team leader and field staff person will then be assigned to obtain the offsite well water samples.

Table 7. FIELD TEAM RESPONSIBILITIES

	Sub-contractor coodinator	Health & safety officer	Equipment custodian	Sample logger	Sampler
Field team leader	X	X		X	X
Field staff			X	X	X

Schedule

The schedule of the Remedial Investigation, Part 1 activities is shown in Figure 5.



* TENTATIVE START DATE JUNE 10, 1985

FIGURE 5. SCHEDULE OF REMEDIAL INVESTIGATION PART 1 FIELD ACTIVITIES

APPENDIX A

INFORMATION SOURCES

APPENDIX A
INFORMATION SOURCES

MONTROSE CHEMICAL COMPANY

- Remedial Investigation Work Plan. November 27, 1984.
- Onsite Groundwater Sampling Plan. January 30, 1985.
- Health & Safety Plan. February 4, 1985.

USEPA - REGION IX PROJECT FILES

- Census of Agriculture. 1974.
- USEPA. Short Term Tests for Carcinogens, Mutagens, and Other Genotoxic Agents. July 1979.
- USEPA. Final Ambient Water Quality Criteria for DDT. EPA-44-5-80-038.
- USEPA. Wastewater Treatment Technology. USEPA 440/9-76-009. February 1976.
- LA County Engr. et al. Disposal of Wastes into the Pacific Ocean, the LA Harbor Area, and Dominguez Channel. September 1967.
- Draft EIS Safe Collection, Transport, and Final Disposal of US Defense Stocks of DDT. June 1980.
- Olin Corp. Alabama Study - Redstone Arsenal DDT Contamination.
- Environmental Monitoring Systems Laboratory. Photogrpahic Analysis of Four California Hazardous Waste Study Sites. September 1981.

SITE VISITS

- USEPA Personnel. November 9 and 10, 1982.
- M&E Personnel. October 26, 1984; January 22, 1985; and with USEPA Project Officer, February 5, 1985.

REMEDIAL INVESTIGATION TASK 3 DATA GATHERING

- W.J. Hayes Pesticides Studied in Man. 1982.
- American Conference of Governmental and Industrial Hygienists. Documentation of the Threshold Limit Values. 4th Edition.

- Registry of Toxic Effects of Chemical Substances RTECS Vol. 3, P-Z NIOSH. 1981-82.

- W. Deichmann. The Debate on DDT. 1971.

- K. Verschveren. Handbook of Environmental Data on Organic Chemicals. 1977.

- Cross-sectional study of a community with exceptional exposure to DDT: Trana, Alabama.

- Int. Arch. Occup. Environ. Health. Long Term Occupational Exposure to DDT. 1981.

- H. Wolfe Scientific Communications, Arch. Environ. Health Vol. 23. Exposure of Formulating Plant Workers to DDT. 1971.

- Mutation Research. Cytogenetic Study on Individuals Occupationally Exposed to DDT. 1975.

- DWR. Well Data. Varies.

- DWR. Water Quality Data. Varies.

- DWR. West Coast Basin Watermaster Service map of well locations and precipitation stations.

- DWR. Bulletin No. 107. Recommended Well Construction and Sealing Standards for Protection of Groundwater Quality in West Coast Basin, Los Angeles County. August 1962.

- DWR. Well locations within 5 miles of Montrose. USGS Quadrangles.

- DWR. Well logs.

- DWR. Bulletin No. 74-4. Water Well Standards. Central Hollywod, Santa Monica Basins, Los Angeles County. October 1965.

- The Resources Agency. Watermaster Service Central Basin, Los Angeles County, July 1, 1981- June 30, 1982. October 1982.

- The Resources Agency. Watermaster Service in the West Coast Basin, Los Angeles County, July 1, 1983 - June 30, 1984. September 1984.

- Harbors Environmental Projects Institute. Environmental Investigations and Analyses: Los Angeles - Long Beach Harbors 1973-1976. December 1976.

- DWR. Bulletin No. 130-74. Hydrologic data: Southern California. March 1976.

- Port of Los Angeles. Worldport of LA 1984 Annual Report.
- US Army Corps of Engineers, Los Angeles District, and Los Angeles Harbor Dept. Final EIS/EIR Los Angeles Harbor Deepening Project. February 1980
- California Resource Agency. Review of Information Pertinent to Los Angeles - Long Beach Harbor and Dominguez Channel. May 1969.
- USC Harbors Environmental Projects. Marine Environment in Los Angeles and Long Beach Harbors During 1978. June 1980.
- Port of Los Angeles. Consolidate Slip Dredging Project.
- Port of Los Angeles. Negative Declaration and Various Related Backup Documents for EIR.
- Bookman-Edmonston Engineering, Inc. Annual Report on Results of Water Quality Monitoring Water Year 1982-83. April 1984.
- RWQCB. Water Well Sampling PRogram for Priority Pollutants.
- RWQCB. Water Quality Control Plan - Los Angeles River Basin 4B - Main Text.
- RWQCB. Water Quality Control Plan - Los Angeles River Basin 4B - Abstract.
- RWQCB. Water Quality/Water Rights 1978-1980 Report.
- RWQCB. Brief for Interviewer, Montrose Chemical Corp. of California in the U.S. Court of Appeals No. 23,813. August 31, 1970.
- DOHS. Well logs for all wells within approximately 5 miles of Montrose site wells.
- Brown & Caldwell. Evaluation of Alternatives: South Reach West Coast Basin Barrier Project. January 1984.
- LAFCD Hydraulic Section. Map of Major Facilities Control + Conservation of Flood Waters which displays all open channel storm drains.
- LAFCD Hydraulic Section. Plan and profile of storm drain along Kenwood Avenue Channel.
- LAFCD Hydraulic Section. Inlet and Outlet Structure Drawings under project No. 1250.
- LAFCD Hydraulic Section. Storm Drain Maps on overlay of Thomas Bros. map (pages 63, 64, 68, 69, 73, 74)

- LAFCD Hydraulic Section. Storm drains overlaid on topographic quadrangles (Quads 4,5,7,8).

- LAFCD Hydraulic Section. Daily discharge summaries for gaging station at Vermont Avenue.

- LAFCD Groundwater Recharge Section. Contour maps for shallow and deep aquifers 1930s to 1940s.

- LAFCD Groundwater Recharge Section. Report on the Groundwater Conditions in Los Angeles County for the Current Water Year Oct 1, 1983 - June 30, 1984

- LAFCD Groundwater Recharge Section. Map of well locations known by LAFCD.

- LAFCD Groundwater Recharge Section. Maps of wells sampled by LAFCD for water quality.

- LAFCD Groundwater Recharge Section. Determine whether wells are operational and available for sampling.

- LAFCD Water Conservation Section. Samples taken monthly at Torrance Lateral (Station #69-A3) at Main Avenue.

- LAFCD Water Conservation Section. List of well numbers, well owner (address and phone No.) for wells sampled by DWR and LAFCD.

- LAFCD Hydrology Section. Rainfall intensity data.

- LAFCD Project Management Section. Montrose area designated flood hazard Zone C, representing an area of minimal flood potential.

- LAFCD Safety Section. Title 8 Cal OSHA, Article 108 Confined Space Entry Requirements are a bare minimum requirement only.

- LAFCD Safety Section. Work Area Traffic Control Handbook.

- LAFCD O&M Section. Maps locating manholes along 1250/685 bond issue drains.

- Dominguez Channel - Report on Investigation of Probable Effects on Quality of Groundwater Resulting from Proposed Revisions in Channel Grand and Alignment. 1955.

- Dominguez Channel test section, saline water infiltration study, final report. 1960

- Dominguez Gap Barrier Project - Unit 4 observation wells. Water Conservation Division. 1973.

- Coastal Basins Barrier and Replenishment Investigation, Dominguez Gap Barrier Project geologic investigation. 1962.

- Comprehensive plan for the drainage of Gardena Valley. 1939.

- 1958 Storm Drain Program Condensed Reports 627.41 LA Co. 1964.

- Water and Air Research Inc. for U.S. Army Corps of Engineers. Final Contract Report, Engineering and Environmental Study of DDT Contamination of Hunstville Spring Branch, Indian Creek, and Adjacent Lands and Waters, Wheeler Reservoir, Alabama. November 1980.

- State Water Resources Control Baord. California State Mussel Watch. 1981-83.

- County Sanitation District of LA County, Research & Development Division. Pesticides and Heavy Metals Progress Report. December 1970.

- County Sanitation Districts of LA County, Technical Services Department. Chlorinated Hydrocarbons Progress Report. December 1971.

- County Sanitation Districts of LA County, Technical Services Department. Chlorinated Hydrocarbon Study Progress Report. July 1973.

- County Sanitation Districts of LA County, Monitoring Section. DDT in Sewers Downstream of Montrose Chemical Co. July 1977.

APPENDIX B

CBSA ANALYSIS PROCEDURE

PARA-CHLOROBENZENE SULFONIC ACID IN GROUNDWATER BY LIQUID CHROMATOGRAPHY

1. SCOPE AND APPLICATION

1.1 This method is applicable to the determination of para-chlorobenzene sulfonic acid in groundwater samples. The calibration range is from one to 100 ug/mL, and samples above this level should be diluted.

1.2 This method has only been tried on a limited number of samples and caution should be used in its application.

1.3 Where trade names or specific products are noted in the method, equivalent apparatus and chemical reagents may be used. Mention of trade names or specific products is for the assistance of the user and does not constitute endorsement by the U.S. Environmental Protection Agency.

2. SUMMARY OF METHOD

2.1 Groundwater samples are analyzed by high performance liquid chromatography using ion-paired reverse-phase techniques.

3. APPARATUS AND MATERIALS

3.1 Liquid chromatograph- A complete high performance liquid chromatograph with a 10 um C-18 reverse-phase column and a variable wavelength UV detector set to 265 nm. Reproducible sample injections of 30 uL should be possible.

4. REAGENTS

4.1 The eluent is 12.5% methanol and 90% an aqueous solution containing 0.25 g/L of boric acid and 0.002M tetrapropyl ammonium hydroxide. It may be necessary to vary the methanol concentration slightly from 12.5% in order to optimize the chromatography.

4.2 para-Chlorobenzene sulfonic acid, sodium salt (Pfaltz and Bauer).

4.3 Tetrapropyl ammonium hydroxide (Aldrich).

4.4 Stock standard solution - Prepare a 1000 ug/mL aqueous solution of para-chlorobenzene sulfonic acid or the equivalent from the sodium salt.

4.5 Working standards - Prepare 5,10,25,50 and 100 ug/mL solutions by

diluting the stock standard solution with water.

5. CALIBRATION

5.1 A linear calibration curve should be prepared by analyzing the five working standards. Peak heights have been found to give the most linear calibration curve. Peak areas may be used if they can be shown to lead to a linear calibration curve. In either case, special attention must be paid to the lowest concentration standards.

5.2 30 uL injections were used at NEIC for all standards and samples. A flow rate of 1.5 mL/min can be used as a starting point for optimization.

6. SAMPLE ANALYSIS

6.1 para-Chlorobenzene sulfonic acid will be determined in the samples in the same manner as in the standards. For some samples it will be difficult to determine the proper baseline for peak height or area measurement. The analyst is responsible for correctly measuring the peak height or area.

6.2 Samples should be diluted with water to fall within the range of 1 to 100 ug/mL.

7. QUALITY CONTROL

7.1 One sample from each quality control groups should be analyzed in triplicate and the percent relative standard deviation reported. For each triplicate a separate preparation and dilution should be made, starting from the original sample.

7.2 One sample from each quality control group should be spiked. The total sample plus spike concentration after dilution should be less than 100 ug/mL. The spike amount should be between 50% and 200% of the sample concentration. If this amount is less than 25 ug/mL, a spike of 25 ug/mL should be used. Report the percent recovery.

7.3 In order to determine the limit of detection, analyze the 5 ug/mL standard seven times and calculate the standard deviation. The limit of detection is three times this standard deviation. It may be possible to lower the limit of detection by increasing the sample loop size, but this possibility has not been tested.

APPENDIX C

USEPA NCLP FORMS

REQUEST FOR SOIL/SEDIMENT SAMPLE ANALYSIS (BY SAMPLE)

Sample location	Proposed date	Concentration Low	Concentration Med	Concentration High	Analysis required: Organics					Inorganics		Other	
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
46D 0-6 in	6/17		X		V	SV	P	All	D	M	CN^-	**SAS1[a]**	SAS2[b]
46D 2 ft.	6/17		X		V	SV	P	All	D	M	CN^-	**SAS1[a]**	SAS2[b]
46D 4 ft.	6/17	X			V	SV	P	**All**	D	**M**	**CN^-**	SAS1[a]	SAS2[b]
46D 6 ft.	6/17	X			V	SV	P	All	D	M	CN^-	**SAS1[a]**	SAS2[b]
46D 8 ft.	6/17	X			V	SV	P	All	D	M	CN^-	**SAS1[a]**	SAS2[b]
46D 10 ft.	6/17	X			V	SV	P	**All**	D	**M**	**CN^-**	SAS1[a]	SAS2[b]
DUPLICATE	6/17		X		V	SV	P	All	D	M	CN^-	**SAS1[a]**	SAS2[b]
DUPLICATE	6/17	X			V	SV	P	**All**	D	**M**	**CN^-**	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]

Totals	V	SV	P	All	D	M	CN^-	SAS1	SAS2
Low concentration				3		3	3	2	
Medium concentration								3	
High concentration									

a. SAS1 - chlorinated aromatics, total organic carbon EPA 9060, DDT, and isomers.
b. SAS2 - grain size analysis.

1014-SA-137

BOE-C6-0177770

REQUEST FOR SOIL/SEDIMENT SAMPLE ANALYSIS (BY SAMPLE)

Sample location	Proposed date	Concentration			Analysis required								
		Low	Med	High	Organics					Inorganics		Other	
36D 0-6in	6/18		X		V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
36D 2ft	6/18		X		V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
36D 4 ft	6/18	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	SAS1[a]	SAS2[b]
36D 6 ft	6/18	X			V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
36D 8 ft	6/18	X			V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
36D 10 ft	6/18	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	SAS1[a]	SAS2[b]
DUPLICATE	6/18	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
26D 0-6in	6/18		X		V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
26D 2ft	6/18		X		V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
26D 4 ft	6/18	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	SAS1[a]	SAS2[b]
26D 6 ft	6/18	X			V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
26D 8 ft	6/18	X			V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
26D 10 ft	6/18	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	SAS1[a]	SAS2[b]
DUPLICATE	6/18		X		V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
BACKGROUND	6/18	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	SAS1[a]	SAS2[b]
BACKGROUND	6/18	X			V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
Totals: Low concentration								6		6	6	5	
Medium concentration												5	
High concentration													

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a. SAS1 - chlorinated aromatics, total organic carbon EPA 9060, DDT, and isomers.

b. SAS2 - grain size analysis.

1014-SA-137

REQUEST FOR SOIL/SEDIMENT SAMPLE ANALYSIS (BY SAMPLE)

Sample location	Proposed date	Concentration Low	Med	High	Analysis required: Organics					Inorganics		Other	
16D 0-6in	6/19		X		V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
16D 2ft	6/19		X		V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
16D 4ft	6/19	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
16D 6ft	6/19	X			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
16D 8ft	6/19	X			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
16D 10ft	6/19	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
DUPLICATE	6/19	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
15D 0-6in	6/19		X		V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
15D 2ft	6/19		X		V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
15D 4ft	6/19	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
15D 6ft	6/19	X			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
15D 8ft	6/19	X			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
15D 10ft	6/19	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
25D 0-6in	6/19		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
25D 2ft	6/19		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
25D 4ft	6/19	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
25D 6ft	6/19	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
25D 8ft	6/19	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
25D 10ft	6/19	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
DUPLICATE	6/19	X			V	SV	P	All	D	M	CN^-	(SAS)[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
Totals: Low concentration								7		7	7	7	
Medium concentration												6	
High concentration													

a. SAS1 - chlorinated aromatics, total organic carbon EPA 9060, DDT, and isomers.
b. SAS2 - grain size analysis.

1014-SA-137

REQUEST FOR SOIL/SEDIMENT SAMPLE ANALYSIS (BY SAMPLE)

Sample location	Proposed date	Concentration Low	Med	High	Analysis required: Organics V	SV	P	All	D	Inorganics M	CN^-	Other SAS1[a]	SAS2[b]
35D 0-6in	6/20		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
35D 2 ft	6/20		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
35D 4 ft	6/20	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
35D 6 ft	6/20	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
35D 8 ft	6/20	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
35D 10 ft	6/20	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
DUPLICATE	6/20	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
45D 0-6in	6/20		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
45D 2 ft	6/20		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
45D 4 ft	6/20	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
45D 6 ft	6/20	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
45D 8 ft	6/20	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
45D 10 ft	6/20	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
DUPLICATE	6/20		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
34D 0-6in	6/20		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
34D 2 ft	6/20		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
34D 4 ft	6/20	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
34D 6 ft	6/20	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
34D 8 ft	6/20	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
34D 10 ft	6/20	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
Totals: Low concentration								7		7	7	6	
Medium concentration												7	
High concentration													

a. SAS1 - chlorinated aromatics, total organic carbon EPA 9060, DDT, and isomers.
b. SAS2 - grain size analysis.

1014-SA-137

REQUEST FOR SOIL/SEDIMENT SAMPLE ANALYSIS (BY SAMPLE)

Sample location	Proposed date	Concentration			Analysis required								
		Low	Med	High	Organics					Inorganics		Other	
24D 0-6 in	6/24		X		V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
24D 2 ft	6/24		X		V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
24D 4 ft	6/24	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	SAS1[a]	SAS2[b]
24D 6 ft	6/24	X			V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
24D 8 ft	6/24	X			V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
24D 10 ft	6/24	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	SAS1[a]	SAS2[b]
DUPLICATE	6/24		X		V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
DUPLICATE	6/24	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
BACKGROUND	6/24	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	SAS1[a]	SAS2[b]
BACKGROUND	6/24	X			V	SV	P	All	D	M	CN^-	[✓ SAS1[a]]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]

Totals:									
Low concentration				4		4	4	3	
Medium concentration								3	
High concentration									

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a. SAS1 - chlorinated aromatics, total organic carbon EPA 9060, DDT, and isomers.
b. SAS2 - grain size analysis.

REQUEST FOR SOIL/SEDIMENT SAMPLE ANALYSIS (BY SAMPLE)

Sample location	Proposed date	Concentration Low	Med	High	Analysis required: Organics					Inorganics		Other	
14D 0-6in	6/25		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
14D 2 ft	6/25		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
14D 4 ft	6/25	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
14D 6 ft	6/25	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
14D 8 ft	6/25	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
14D 10 ft	6/25	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
13D 0-6in	6/25		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
13D 2 ft	6/25		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
13D 4 ft	6/25	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
13D 6 ft	6/25	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
13D 8 ft	6/25	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
13D 10 ft	6/25	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
DUPLICATE	6/25	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
23D 0-6in	6/25		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
23D 2 ft	6/25		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
23D 4 ft	6/25	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
23D 6 ft	6/25	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
23D 8 ft	6/25	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
23D 10 ft	6/25	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
DUPLICATE	6/25		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
Totals: Low concentration								7		7	7	6	
Medium concentration												7	
High concentration													

a. SAS1 - chlorinated aromatics, total organic carbon EPA 9060, DDT, and isomers.
b. SAS2 - grain size analysis.

1014-SA-137

REQUEST FOR SOIL/SEDIMENT SAMPLE ANALYSIS (BY SAMPLE)

Sample location	Proposed date	Concentration Low	Med	High	Analysis required: Organics V	SV	P	All	D	Inorganics M	CN^-	Other SAS1[a]	SAS2[b]
33D 0-6in	6/26		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
33D 2 ft	6/26		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
33D 4 ft	6/26	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
33D 6 ft	6/26	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
33D 8 ft	6/26	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
33D 10 ft	6/26	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
DUPLICATE	6/26		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
1					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
22D 0-6in	6/26		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
22D 2 ft	6/26		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
22D 4 ft	6/26	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
22D 6 ft	6/26	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
22D 8 ft	6/26	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
22D 10 ft	6/26	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
DUPLICATE	6/26	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
12D 0-6in	6/26		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
12D 2 ft	6/26		X		V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
12D 4 ft	6/26	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
12D 6 ft	6/26	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
12D 8 ft	6/26	X			V	SV	P	All	D	M	CN^-	(SAS1)[a]	SAS2[b]
12D 10 ft	6/26	X			V	SV	P	(All)	D	(M)	(CN)	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
Totals: Low concentration								7		7	7	6	
Medium concentration												7	
High concentration													

a. SAS1 - chlorinated aromatics, total organic carbon EPA 9060, DDT, and isomers.
b. SAS2 - grain size analysis.

1014-SA-137

REQUEST FOR SOIL/SEDIMENT SAMPLE ANALYSIS (BY SAMPLE)

Sample location	Proposed date	Concentration Low	Med	High	Analysis required: Organics					Inorganics		Other	
					V	SV	P		D				
11D 0-6in	6/27	—	X	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
11D 2 ft	6/27	—	X	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
11D 4 ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
11D 6 ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
11D 8 ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
11D 10 ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
DUPLICATE	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
		—	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
		—	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
		—	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
		—	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
21D 0-6in	6/27	—	X	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
21D 2 ft	6/27	—	X	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
21D 4 ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
21D 6 ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
21D 8 ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
21D 10 ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
DUPLICATE	6/27	—	X	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
		—	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
		—	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
		—	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
46D 1ft	6/27	—	X	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
46D 5ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
46D 9ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
14D 1ft	6/27	—	X	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
14D 5ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
14D 9ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
21D 1ft	6/27	—	X	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
21D 5ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
21D 9ft	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
DUPLICATE	6/27	X	—	—	V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
Totals: Low concentration					—	—	—	5	—	5	5	4	7
Medium concentration					—	—	—	—	—	—	—	5	3
High concentration					—	—	—	—	—	—	—	—	—

a. SAS1 - chlorinated aromatics, total organic carbon EPA 9060, DDT, and isomers.
b. SAS2 - grain size analysis.

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REQUEST FOR WATER SAMPLE ANALYSIS (BY SAMPLE)

Sample location	Proposed date	Concentration			Analysis required								
		Low	Med	High	Organics					Inorganics		Other	
MW1	7/1	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	[✓ SAS1[a]]	[✓ SAS2[b]]
MW2	7/1	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	[✓ SAS1[a]]	[✓ SAS2[b]]
blank	7/1	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	[✓ SAS1[a]]	[✓ SAS2[b]]
duplicate	7/1	X			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	[✓ SAS1[a]]	[✓ SAS2[b]]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]

Totals: Low concentration				4		4	4	4	4
Medium concentration									
High concentration									

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[a] SAS1 - CBSA, chlorobenzene sullfonic acid - method user provided.

[b] SAS2 - other ions - alkalinity EPA 310.1; residue filterable EPA 160.1; chloride EPA 325.3; fluoride EPA 340.2; nitrogen nitrate, nitrite EPA 353.2; sulfate EPA 375.4.

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REQUEST FOR WATER SAMPLE ANALYSIS (BY SAMPLE)

Sample location	Proposed date	Concentration Low	Med	High	Analysis required: Organics V	SV	P	All	D	Inorganics M	CN^-	Other SAS1[a]	SAS2[b]
MW3	7/2	x			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
MW4	7/2	x			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
MW5	7/2	x			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
blank	7/2	x			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
duplicate	7/2	x			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]

Totals	V	SV	P	All	D	M	CN^-	SAS1	SAS2
Low concentration				5		5	5	5	5
Medium concentration									
High concentration									

a. SAS1 – CBSA, chlorobenzene sullfonic acid – method user provided.
b. SAS2 – other ions – alkalinity EPA 310.1; residue filterable EPA 160.1; chloride EPA 325.3; fluoride EPA 340.2; nitrogen nitrate, nitrite EPA 353.2; sulfate EPA 375.4.

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REQUEST FOR WATER SAMPLE ANALYSIS (BY SAMPLE)

Sample location	Proposed date	Concentration: Low	Med	High	Analysis required: Organics					Inorganics		Other	
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
OW 1	7/8	X			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
OW 2	7/8	X			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
blank	7/8	X			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
duplicate	7/8	X			V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]

Totals	V	SV	P	All	D	M	CN^-	SAS1	SAS2
Low concentration				4		4	4	4	4
Medium concentration									
High concentration									

a. SAS1 - CBSA, chlorobenzene sullfonic acid - method user provided.
b. SAS2 - other ions - alkalinity EPA 310.1; residue filterable EPA 160.1; chloride EPA 325.3; fluoride EPA 340.2; nitrogen nitrate, nitrite EPA 353.2; sulfate EPA 375.4.

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REQUEST FOR WATER SAMPLE ANALYSIS (BY SAMPLE)

Sample location	Proposed date	Concentration			Analysis required								
					Organics					Inorganics		Other	
		Low	Med	High									
OW3	7/9	x			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	[✓ SAS1[a]]	[✓ SAS2[b]]
OW4	7/9	x			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	[✓ SAS1[a]]	[✓ SAS2[b]]
OW5	7/9	x			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	[✓ SAS1[a]]	[✓ SAS2[b]]
blank	7/9	x			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	[✓ SAS1[a]]	[✓ SAS2[b]]
duplicate	7/9	x			V	SV	P	[✓ All]	D	[✓ M]	[✓ CN^-]	[✓ SAS1[a]]	[✓ SAS2[b]]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]
					V	SV	P	All	D	M	CN^-	SAS1[a]	SAS2[b]

Totals: Low concentration				5		5	5	5	5
Medium concentration									
High concentration									

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a. SAS1 - CBSA, chlorobenzene sullfonic acid - method user provided.
b. SAS2 - other ions - alkalinity EPA 310.1; residue filterable EPA 160.1; chloride EPA 325.3; fluoride EPA 340.2; nitrogen nitrate, nitrite EPA 353.2; sulfate EPA 375.4.

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APPENDIX D

TECHNICAL SPECIFICATIONS

SECTION 01005
MISCELLANEOUS REQUIREMENTS

1 DISPOSAL OF CONTAMINATED SOIL WASTE AND WASHWATER

1 DISPOSAL OF CONTAMINATED SOIL WASTE AND WASHWATER

All drilling waste and well development fluids will be collected by the Contractor and discharged into 55-gal open-head steel drums. These wastes shall be considered hazardous wastes until determined to be otherwise by the Engineer.

Washwater and all solutions remaining after decontamination of the drilling equipment shall be considered hazardous waste until determined to be otherwise by the Engineer.

The Contractor shall provide necessary equipment to contain all washwater created during decontamination such that fluids are not in contact with the ground surface and will not contaminate the ground in any way.

The Contractor shall place soil waste and washwater into containers as directed by the Engineer. The Contractor is required to provide 55-gal DOT Regulation 17H steel drums as necessary to containerize any hazardous material.

The Contractor does not have to assume the role of hazardous waste generator in order to containerize the wastes and remove them to the designated area.

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Section 02020
GROUNDWATER MONITORING WELLS

1 GENERAL

The Contractor shall furnish all labor, materials, and tools as specified. The Contractor shall install groundwater monitoring wells at locations determined by the Engineer.

The Contractor shall use an 8-in. diameter hollow stem auger to drill the well and shall install a 4-in. diameter polyvinylchloride (PVC) casing as specified herein.

The Contractor shall provide one metal extruder to remove soil samples from brass liners as directed by the Engineer.

The work to be done under any item shall not be limited to the exact extent mentioned or described, but shall include all incidental work necessary or customaily done for the completion of that item in accordance with the best practice of the trade.

2 QUALITY ASSURANCE

Install wells and backfill in accordance with Specifications and as directed by the Engineer.

The drilling Contractor shall comply with the site health and safety plan as established by the Engineer at all times while on site. The Contractor shall be responsible for the health and safety of all of his personnel working in potentially contaminated areas on site.

The Contractor is required to decontaminate his equipment prior to beginning drilling operations and after drilling each individual well. The Contractor shall steam-clean his samplers prior to driving of the sampler into the borehole. The Contractor shall submit his equipment decontamination procedure to the Engineer prior to start of work.

3 MATERIALS

The materials for the construction of the test wells shall be as follows:

a. Well casings and screen.

1) 80 ft of 4-in. diameter PVC (ASTM approved), threaded, Schedule 80

2) 20 ft of 12-in.diameter steel casing (temporary protective casing)

3) 20 ft of 4-in. diameter PVC slotted screen, threaded, Schedule 80, 0.01-in. slot size.

4) 5 ft of 8-in. diameter steel casing (permanent riser casing)

The casings and screen shall be joined by threaded joints. Nails, glue, and slip joints shall not be used.

The Contractor shall place a 4-in. diameter PVC threaded cap on bottom of screen, and a 4-in. diameter PVC slip-on cap at top of riser.

b. Filter sand/gravel pack. The filter sand shall consist of clean No. 3 Monterey sand. The filter sand shall be placed in the depth interval 74 to 100 ft and shall be tamped around the well casing to ensure tightness.

c. Bentonite. A slurry of bentonite water and sand may be requested by the Engineer for plugging abandoned boreholes. It shall consist of a dense mixture of powdered bentonite thoroughly mixed with water and shall contain less than 5% by weight of clean silica sand.

Bentonite pellets shall be used to form a 5-ft thick seal in the annular space after placement of sand filter and prior to placing surface seal. Pellets shall be VOL-CLAY or other equivalent brand and shall be rolled or compressed 1/4-in. diameter.

d. Grout. Cement grout shall be a mixture of portland cement and not more than 6 gal of water per bag (1 cubic ft or 94 lb) of cement.

Additives to reduce shrinkage or control time of set shall be used only if directed by the Engineer. The water used shall be fresh, clean, and potable.

4 INSTALLATION

The Contractor shall provide 55-gal open-head DOT regulation 17H drums. Drums will be used to store hazardous liquids and soil cuttings from the drilling procedure. All liquids and cuttings shall be placed in the drums as directed by the Engineer.

The Contractor shall provide 20 by 20 ft impermeable polyethylene groundcover around each drill hole to contain drill cuttings and soil water seepage from cuttings. Other methods to be used shall be approved by the Engineer prior to start of work.

The Contractor shall provide containers to collect all water used during decontamination procedures. Contaminated water will be stored on site in 55-gal drums as specified above.

Sampling shall be by California split-spoon sampler. The Contractor shall provide two samplers per well; each shall be 18-in. long, 2-1/2-in. outside diameter, and fitted with three brass tubes. Brass tubes shall be 2-in. outside diameter, 1-7/8-in. inside diameter with 0.065-in. wall thickness. The Engineer will provide the brass tubes. The Contractor shall provide at least three sample catchers for each sampler at all times.

Prior to taking a soil sample, the samplers and brass tubes shall be decontaminated as specified herein.

5 DRILLING AND SAMPLING

The Engineer will determine the final depth of the monitoring well and screen placement.

The water table elevation is estimated to be 70 to 80 ft below ground surface. For determination of groundwater elevation, a measurement shall be made by the Contractor when reaching the water table.

Drilling shall proceed by driving the sampler ahead of the hollow stem auger into undisturbed soil. The Contractor shall remove the sampler and present the open split spoon to the Engineer. The 8-in. hollow stem auger will then drill down to the same level as the sampler. The Contractor shall keep a record of the number of blows needed to drive the sampler and will notify the Engineer of the blow counts for each sample taken.

Continuous sampling shall proceed to a total depth of 20 ft, except one well which shall be sampled to 30 ft.

At a depth of 20 ft, the Contractor will remove the hollow stem auger and ream the hole using a 12-in. diameter bit to a depth of 20 ft. The Contractor shall install a 12-in. diameter protective steel casing to a depth of 20 ft.

The Contractor will resume sampling at 5-ft intervals.

At a depth of 100 ft, the Contractor shall place a 1-ft thick layer of clean filter sand in the bottom of the hole.

The Contractor will attach a threaded cap to the 4-in. diameter PVC well screen and connect the threaded PVC casing lengths. All PVC casing, screen, and caps shall be connected by the use of threaded joints. Glue or other methods shall not be used to connect joints. The Contractor will install casing on top of the sand filter layer.

Backfill annulus between screen and borehole with clean filter sand to height 2 ft above well screen or as specified by the Engineer. Remove auger during and after placement of casing and sand.

The Contractor shall place a 5-ft layer of bentonite pellets on top of filter sand. Place cement grout from the top of the bentonite layer to ground surface in one continuous operation using a tremie pipe. The Contractor shall remove 12-in. steel protective casing simultaneously.

Install 5-ft length of 8-in. diameter protective steel casing allowing steel casing to rise 2 ft above ground level. The top of the riser casing shall be fitted with a locking cap. The Contractor shall supply the Engineer with two keys to each locking cap.

The Contractor shall perform no further work for a 24-hr period to allow the cement grout to set.

6 DEVELOPING WELLS

Developing shall be done by pumping, bailing, or other suitable means acceptable to the Engineer until the water produced is clear and contains no sand or other solid material. The Engineer will determine when the well is sufficiently developed.

7 DECONTAMINATION

All drilling equipment will be decontaminated before drilling each hole and after drilling the last hole. Drilling equipment shall not leave the site until it has been decontaminated.

Decontamination procedure involves steam cleaning all equipment; residue from this operation shall be placed in a 55-gal open-head DOT drum.

Split-spoon samplers will be decontaminated before use and after each sample has been retrieved.

Decontamination procedure:
a. Wash split spoon with clean water.
b. Wash split spoon with TSP solution.
c. Rinse split spoon with distilled water.

The Engineer will determine if proper decontamination procedures are being followed.

8 RECORDS

As the work progresses, the Contractor's drill crew foreman shall keep a complete, neat, accurate, and legible record of each boring that shall contain the following:

a. Date and time

b. Engineer, Contractor, inspector, and drill foreman

c. Well number

d. Ground elevation at hole as established by the Engineer

e. Type of well

f. Height of drop and weight of drop hammer for taking drive sample; and size of drill rod

g. Results of all boring details arranged on a boring log showing the stratification, thickness, and classification of materials penetrated, sample locations, type, length, recovery, and number of blows required for each 6-in. penetration of the sampler

h. Depth of bottom hole

i. Depth at which rock or refusal was encountered

j. Note any loss of water

9 SUBMISSION OF REPORTS AND SAMPLES

No later than one day after completion of each boring and other subsurface exploration, one copy of the signed field log shall be mailed by the Contractor to the office of Metcalf & Eddy, Inc., P.O. Box 10-046, Palo Alto, CA 94303, or given to the inspector at the site.

SECTION 02010

SOIL BORINGS

1 GENERAL

The Contractor shall furnish all labor, materials, tools, and equipment necessary for making and completing borings, including drilling boreholes, taking and preserving required samples, keeping records, submitting field and final logs, and all other work necessary to complete each specified item of work. The Contractor shall provide one metal soil extruder to remove soil samples from brass liners as directed by the Engineer.

The work to be done under any item shall not be limited to the exact extent mentioned or described, but shall include all incidental work necessary or customarily done for the completion of that item in accordance with the best practice of the trade.

2 QUALITY ASSURANCE

Install boreholes and backfill in accordance with Specifications and as directed by the Engineer.

The drilling contractor shall comply with the site health and safety plan as established by the Engineer at all times while on site. The Contractor shall be responsible for the health and safety of all of his personnel working in potentially contaminated areas on site.

The Contractor is required to decontaminate his equipment prior to beginning drilling operations and after drilling each individual borehole. The Contractor shall steam-clean his samplers prior to driving the sampler into the borehole. The Contractor shall submit his equipment decontamination procedure to the Engineer prior to start of work.

3 BORINGS

All borings shall be made at locations designated and to depths required by the Engineer. The boring diameter, depth, size and type of samples shall be as indicated on the drawings. Unless otherwise indicated, a boring shall normally consist of an 8-in. diameter borehole and 2-in. outside diameter split spoon sample using a California sampler.

If a boulder or other obstruction is encountered, the boring shall proceed through the obstruction by drilling or other means unless termination of the boring is authorized by the Engineer.

Boreholes shall not be backfilled until authorization has been given by the Engineer. A slurry of bentonite, water, and sand may be requested by the Engineer for plugging abandoned boreholes. It shall consist of a dense mixture of powdered bentonite thoroughly mixed with water and shall contain less than 5% by weight of clean silica sand such that a plug will form preventing percolation of surface water into the borehole.

4 BOREHOLE

The hollow-stem auger shall be driven or augered vertically through earth or other materials to such depth below the surface of the ground as required to obtain samples or as directed by the Engineer.

The borehole shall be advanced by driving the sampler ahead of the hollow-stem auger. The auger shall not drill past the leading tip of the sampler.

The Contractor shall remove the sampler and present the open split spoon to the Engineer. The hollow stem auger will then drill down to the same level as the sampler. The Contractor shall keep a record of the number of blows needed to drive the sampler and will notify the Engineer of the blow counts for each sample taken. Continuous sampling shall proceed to a total depth of 10 feet or 20 ft as directed by the Engineer.

During all drilling and sampling activities, the Contractor shall use a 20 ft by 20 ft polyethylene sheet or other approved method to prevent contact bewteen original ground surface and drill cuttings or soil.

The hollow stem auger and samplers shall all be thoroughly steam cleaned prior to mobilizing onsite and at the end of drilling operations.

The Contractor shall take precautions not to contaminate the hollow stem auger or samplers with any grease, oils, or other contaminants after steam cleaning.

The Contractor shall provide the drilling crews with all necessary personal protection while performing work onsite. Personal protection may include steel-toed rubber boots, hard hats, splash-proof goggles, tyvek coveralls, rubber gloves, and half-mask respirators fitted with organic vapor cartridges.

5 SAMPLING

The driller shall provide two California samplers per drill rig. Each sampler shall be 18-in. long, 2-1/2-in. outside diameter, fitted with three brass tubes. The Contractor shall provide at least two sample catchers for each sampler at all times.

Samples shall normally be taken at the ground surface and continuously thereafter, unless otherwise directed or authorized by the Engineer.

The samples shall be obtained by driving the 18-in. long sampler into the undisturbed material below the bottom of the borehole. The sampler will be fitted with three 6-in. long brass tubes to contain the soil samples.

The samplers will be washed in a trisodium phosphate (TSP) solution and rinsed with clean water between each sampler penetration. The samplers and hollow stem auger shall be steam cleaned beween boreholes and the washwater shall be collected in clean 55-gal covered drums to be stored onsite.

The Contractor shall provide clean 55-gal open-head steel drums in accordance with DOT Regulation 17H.

6 SPLIT SPOON SAMPLES

Split spoon samples shall be obtained by driving sampler for its full depth with a 140-lb hammer having a drop of 30 in. The number of blows for each 6 in. of penetration shall be recorded by the driller.

Refusal, as used in these specifications, is defined as being a rate of advance of the standard split spoon sampler of less than 12 in. per 120 blows or 1 in. per 50 blows when driven with a 140-lb. weight free-falling 30 in.

Split spoon samplers shall be opened and promptly given to the Engineer to log and seal the samples.

7 RECORDS

As the work progresses, the drill crew foreman shall keep a complete, neat, accurate, and legible record of each boring that shall contain the following:

a. Date and time.

b. Engineer, Contractor, inspector, and drill foreman.

c. Boring number.

d. Ground elevation at hole (established by the Engineer).

e. Type of borehole.

f. Heights of drop and weight of drop hammer for taking drive sample, and size of drill rod.

g. Results of all boring details arranged on a boring log showing the stratification, thickness, and classification of materials penetrated, sample locations, type, number, length, recovery, and number of blows required for each 6-in. penetration of the sampler.

h. Depth of bottom hole.

8 SUBMISSION OF REPORTS AND SAMPLES

No later than one day after completion of each boring and other subsurface exploration, one copy of the signed field log for that boring or exploration shall be given to the inspector at the site.

Samples will be handled and shipped by the Engineer.

***

APPENDIX E

HEALTH & SAFETY PLAN

METCALF & EDDY
SITE HEALTH & SAFETY PLAN
MONTROSE FACILITY SITE
PART I

Contracting authority: USEPA
Site location: Los Angeles, California
Written by: K. Walker Date: 10 April 1985
Reviewed by: E. Cichon Date: 16 April 1985

This Health & Safety Plan has been developed in accordance with Metcalf & Eddy's Health and Safety Manual for Hazardous Waste Projects. A copy of the manual will be available at the field office.

1.0 PROJECT OBJECTIVES

To complete a hydrogeologic study designed to determine if contaminants from the site are migrating through the unsaturated subsurface zone to groundwater and to determine the extent of site soil contamination.

2.0 SITE HISTORY

The Montrose Facility site covers approximately 13 acres on Normandie Avenue in Los Angeles, California (Figure 1). From 1947 to 1982, the pesticide DDT was manufactured and/or processed at this site. Due to its persistence and toxic effects on wildlife, DDT use was banned in the United States in 1972, and it is now listed as an USEPA priority pollutant. Montrose Chemical has ceased operations and demolished the DDT manufacturing facility and has proposed to redevelop the property as a warehouse facility.

There is evidence that DDT has been released from the Montrose site into the surrounding environment. In 1982, USEPA investigation found DDT in surface water runoff and sediments leaving the Montrose property. High concentrations of DDT have

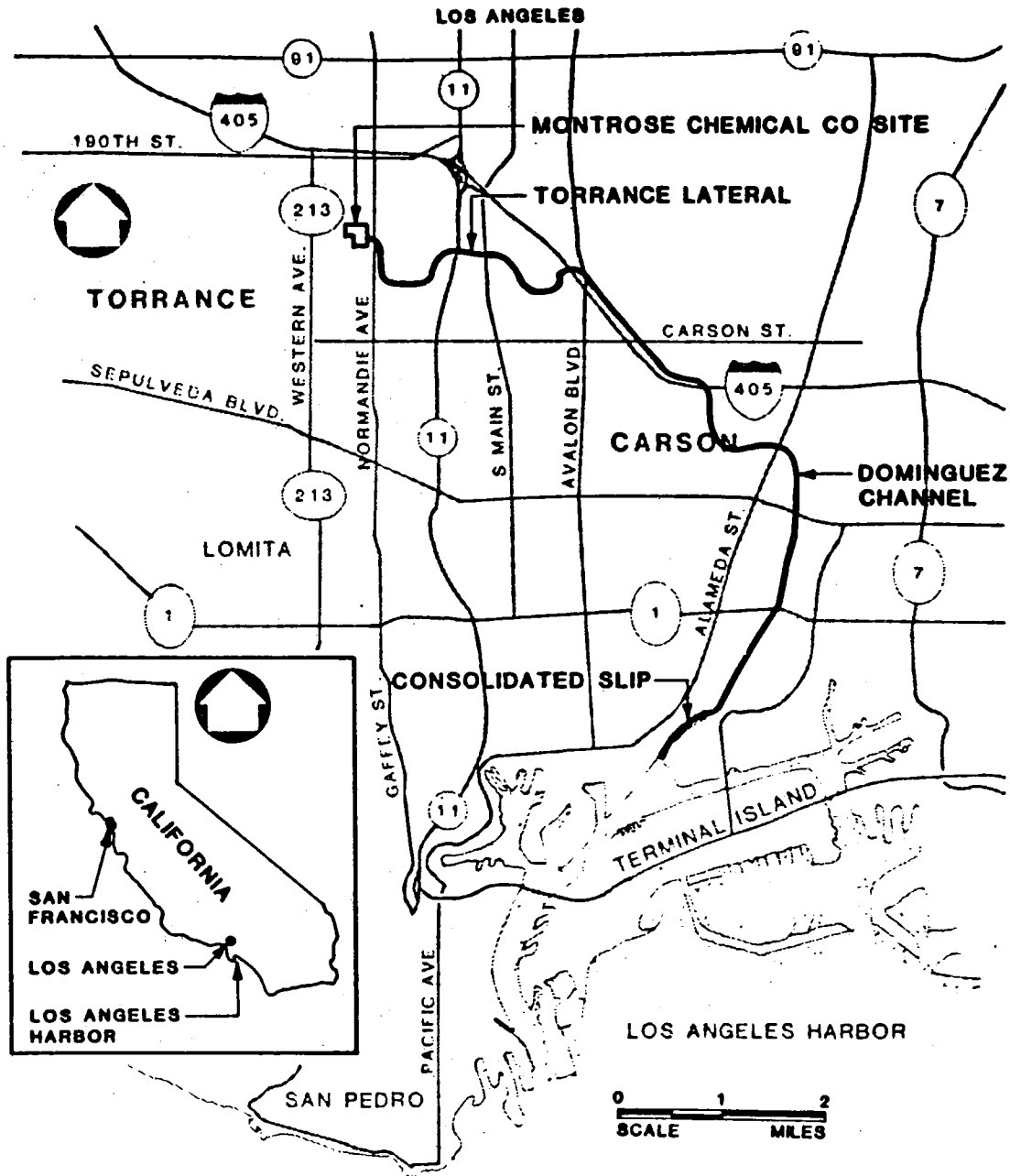

FIGURE 1. LOCATION MAP - MONTROSE FACILITY SITE

been identified in sewers that received Montrose wastes prior to 1972, and also in portions of the Dominguez Channel and Los Angeles Harbor. It has been reported that pulverizing of DDT at Montrose may have resulted in aerial dispersion of DDT throughout the surrounding area.

Until recently, the site was completely open, but Montrose has now capped the site in an effort to control DDT migration via runoff and infiltration into groundwater.

3.0 HAZARD ASSESSMENT

The data currently available for the site suggest that there are three major compounds to which the investigation team may be exposed during the drilling program: DDT and its breakdown products (DDD, DDE), monochlorobenzene (MBC), and benzene. Of these, exposure to DDT, DDE, and DDD appears to be of primary concern. MCB, a raw material of DDT, may be present in subsurface soils or in groundwater but its presence at the site has not been well characterized. High concentrations of benzene (155,000 ppb) have been detected in groundwater at the Del Amo facility adjacent to the Montrose site and may therefore be encountered in groundwater at Montrose.

DDT has been detected in high concentrations in soils on the site. A sampling program conducted in 1983 to characterize the vertical and areal extent of DDT contamination found DDT levels in the following ranges:

Depth, ft	Concentration, mg/kg
0-1	5.6-95,000
1-2	0.63-59,000
2-3	0.072-810
3-5	0.028-31
5-6	0.033-4.1

Although DDT is relatively poorly absorbed through the skin and lungs, poor personal hygiene practices could lead to ingestion of small amounts of DDT. While sufficient doses to cause symptoms of acute toxicity are unlikely given the asphalt cap on the site, even small doses should be avoided. DDT, DDE, and DDD all have a strong tendency to bioaccumulate and have been shown to cause cancer in laboratory animals.

Exposure to MCB and benzene could occur during the drilling process if pockets of contamination are encountered. MCB is a mucous membrane irritant but at airborne concentrations that are unlikely to be encountered during drilling. Unless soil and groundwater contamination by MCB and benzene is extensive, the small diameter boreholes and the large open site will likely limit airborne concentrations. Benzene has been associated with leukemia in working populations chronically exposed to the compound.

4.0 PERSONNEL

USEPA
Project officer: Therese Gioia

M&E
Site manager: Paul Levine
Field staff: Candice Tal
Field staff:

5.0 SITE WORK ZONES

Three basic work zones must be established for this project: a restricted zone encompassing the drilling locations on the site, a decontamination zone for cleaning of personal protective equipment and drilling equipment, and a clean zone. While not formally delineated by barriers, these zones functionally separate the three activities on the site: (1) the drilling operations; (2) decontamination; and (3) storage and use of clean equipment, first aid materials, etc.

The zones must be established so that the clean zone is nearest the exit or entrance to the site so that by the time persons or equipment leave the site, they have been through decontamination.

6.0 ACCESS TO UTILITIES

Water: Purchase water and bring onsite.
Telephone: Onsite in shed (213-771-2034)

7.0 GENERAL SAFETY MEASURES

The following general safety procedures shall be followed by all persons entering and/or working on the site:

- No employee or subcontractor may be allowed onsite without the prior knowledge and consent of the site Health & Safety Officer.
- There will be no activities conducted onsite without sufficient backup personnel. At a minimum, three persons must be present at the site.
- All contractor or subcontractor personnel shall bring to the attention of the site Health & Safety Officer or resident project representative any unsafe condition or practice associated with the site activities that they are unable to correct themselves.
- There will be no smoking, eating, chewing gum, or drinking in the restricted area.
- Hands shall be thoroughly cleaned prior to smoking, eating, or other activities outside the restricted area.
- Team members must avoid unnecessary contamination (i.e., walking through known or suspected "hot" zones or contaminated puddles, kneeling or sitting on the ground, leaning against potentially contaminated barrels or equipment).
- Respiratory devices may not be worn with beards, long sideburns, or under other conditions that prevent a proper seal.
- Respiratory devices may not be worn with contact lenses.

8.0 PERSONAL PROTECTIVE CLOTHING

Level of personnel protection: A ___; B ___; C ?; D X

Level D is expected to be the level of protection sufficient for most work on the site. For this site, level D clothing will include light cotton work clothes, tyvek coveralls (disposable), nitrile/latex rubber gloves, and rubber boots.

Tyvek coveralls will help ensure that DDT-contaminated soils are not carried home on work clothing at the end of the day. The tyveks must be discarded if they become torn and, at a minimum, at the end of each work day.

Should high levels (see Monitoring discussion below) of organic vapors or dust be generated during the drilling program, employees will be required to don half-mask organic vapor respirators equipped with cartridges for organic vapors (up to 1,000 ppm) and for dusts (with TWA less than 0.05 mg/m^3).

9.0 PERSONNEL MONITORING

Action levels

5	ppm	x	HNu	9.8 10.2	Span pot. setting Ev probe
___	ppm	___	Organic vapor analyzer (OVA)		
___	ppm	NA	Detector tubes		
___	% LEL	NA	Explosimeter		
___	%		NA	Oxygen level meter	
___	mR/hr	NA	Radiation survey meter		

NA = not applicable; LEL = lower explosive limit.

Discussion

5 ppm Organic vapor level - if monitoring consistently finds organic vapor levels above 5 ppm, the site H&S officer will require use of air-purifying respirators.

10.0 DECONTAMINATION REQUIREMENTS

10.1 Personnel Decontamination

All personnel who have been working in the restricted zone as defined in Section 5.0 shall undergo personal decontamination:

- When leaving the restricted zone for coffee or lunch breaks
- At the end of each work day

The decontamination station must be set up by Metcalf & Eddy in the morning of each day in the decontamination zone. It must include the steps listed in Table 1. Steps pertaining to equipment that is not in use (e.g., respirators) may be eliminated.

10.2 Equipment Decontamination

All equipment used in drilling (including shovels, etc.) shall be steam cleaned with a high pressure steam generator before each boring or monitoring well installation (see Table 2).

The driller shall be responsible for supplying the steam generator and for cleaning the equipment.

Table 1. PERSONNEL DECONTAMINATION

Decontamination	Equipment
1. Outer glove and boot wash	1 - 20-30 gallon tub 2 - long handle, soft bristle scrub brushes 1 - compressible sprayer (e.g. 2 gallon garden sprayer), detergent water
2. Outer glove and boot rinse	1 - compressible sprayer (2 gallons), fresh water. Rinse off gloves and boots over wash tub (above).
3. Tyvek removal	1 - Garbage bag
4. Outer glove and boot removal	1 - Plastic drop cloth. Set equipment on plastic
5. Air Purifying Respirator Removal	1 - Plastic drop cloth. Lay equipment down.
6. Tyvek Removal	1 - Garbage can, garbage bags.
7. Hand wash	1 - 3-5 gallon bucket. Powdered hand soap.
8. Hand rinse & dry	1 - 3-5 gallon bucket. Paper towels.

Table 2. EQUIPMENT DECONTAMINATION

Decontamination steps	Equipment
1. High pressure steam rinse	Steam generator
2. Inspect visually	
3. High pressure steam rinse as necessary	Steam generator

11.0 DISPOSAL REQUIREMENTS

All discarded and contaminated Tyvek coveralls, paper towels, etc., must be sealed in plastic garbage bags and disposed with soil cuttings from the borings in 55 gallon drums provided by the driller. Drums must be sealed at the end of each day before leaving the site.

Wash/rinse water from the decontamination station may be discarded in 55-gallon drums to be provided by the driller. Drums must be sealed at the end of each day before leaving the site.

12.0 COMMUNITY RELATIONS

No unauthorized personnel may be permitted on the Montrose site during Metcalf & Eddy's investigation. If local residents, reporters, etc., enter the work site explain politely that health and safety procedures have been set up to protect both the workers and the public. If they refuse to leave, contact the local police department.

13.0 EMERGENCY PLANS

13.1 Medical

13.1.1 Minor Cuts or Abrasions. Wash affected area with soap and water and bandage. A first aid kit with eye wash solution must be located at the Field Office.

13.1.2 Serious Physical Injury. In the event of serious physical injury:

a. Call immediately for ambulance or medical assistance.

b. For physical injuries, follow protocols established in American Red Cross Manual, Standard First Aid and Safety, until assistance arrives. A copy of the manual will be available at the Field Office.

c. If ambulance is not available, transport victim to nearest hospital (see directions on page E-12).

13.1.3 Heat Stress. Heat stress may become a problem at this site because of warm temperatures and use of the Tyvek suits which do not allow evaporative cooling. To help avoid heat stress:

a. Have several cooled bottles or cans of soda or juice in the clean zone. Provide straws so that individuals may go through partial decon (cleaning and removal of gloves) and then be given drinks by the Site Safety Officer without having to open the containers themselves.

b. On warm days, team members should take in liquids at least once an hour.

Symptoms of heat fatigue may include impaired sensory-motor skills and heat rash (prickly heat) in early stages to fatigue, nausea, headache, giddiness, light-headedness in later stages. If a member shows symptoms of heat stress:

a. Move the individual through decon to the "clean zone". Remove Tyveks.

b. Administer cool liquids.

13.2 Record-Keeping Requirements in Emergency Situations

The following information must be recorded by the project engineer or site Health and Safety Officer for any emergency situation as soon as possible:

a. Notifier's name

b. Date, time, and location of the incident

c. Nature of emergency (describe what happened)

d. Type and amount of materials involved

e. Extent of injuries, if any

f. Agencies and/or organizations notified, names of people notified.

g. Actions taken

EMERGENCY PHONE NUMBERS

Metcalf & Eddy

Frank Burton	Project Manager	415-964-7100
Marianne Strickfaden	Project Engineer	415-964-7100
Dr. Mazzie, Palo Alto Medical Center	M&E Medical Consultant	415-321-4121

USEPA

Alexis Strauss	Chief, Enforcement Section	425-974-8915
Therese Gioia	Project Officer	415-974-7465
Timothy Vendlinski	Community Relations Officer	415-974-0255

Montrose Chemical Co.

John Kallock	Contact person	213-323-1056

Local Offsite Support Services

Police		213-320-2611
Fire		213-328-3131
Ambulance		213-328-3131
Hospital	Harbor UCLA Medical Ctr	213-533-2383
Poison control	L.A. County Medical Assn.	213-484-5151

Directions to Hospital (see attached map)

Habor UCLA Medical Center
1000 West Carson
Torrance, California

Drive south on Normandie to Carson Street; turn left on Carson and then right into Emergency Clinic. Thomas Brothers map pg 68, Los Angeles County.

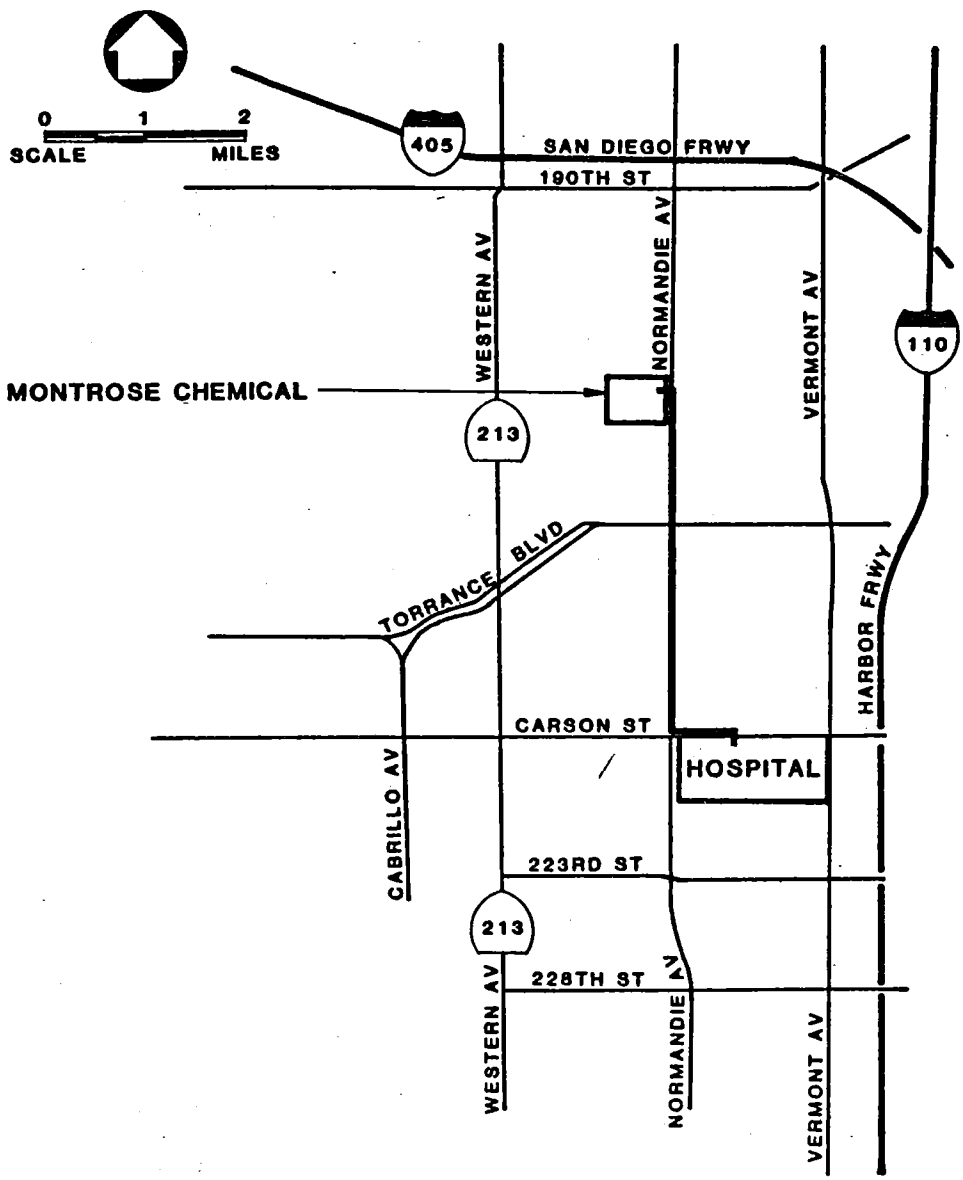

FIGURE 2. DIRECTIONS TO HOSPITAL

SAFETY EQUIPMENT CHECKLIST
(Check equipment needed, indicating number needed at right)

PERSONAL PROTECTION:

X	Ultra-Twin	4
X	Cartridges	GMC-H
X	Safety Boots	4 pr.
___	Latex Booties	___
X	Coveralls (tyvek)	___
___	Coveralls (cotton)	___
X	Hard Hat	4
___	Robert Shaw	___

OTHER (specify):

X	Latex gloves	6 pr.
___	Neoprene gloves	___
___	Safety gloves	___

MONITORING AND SURVEILLANCE:

___	Radiation	___
___	O_2	___
___	OVA	

OTHER (specify):

X	HNU w/11.7 ev	1
___	TLD Badges	___
___	Metal detector	___

DECON EQUIPMENT:

X	Tub	1
X	Water	___
X	Garbage can w/liner	1
X	Bucket	2

MISC.:

First Aid Kit	X
Water	X

OTHER (specify):

Detergent	___
Hand soap	X
SCBA	___
Cascade System	___
Van	___
C level protection	___
Razor blades	___
Pocket transitors	___

APPENDIX F

HYDROGEOLOGIC INVESTIGATION

Appendix F
HYDROGEOLOGIC INVESTIGATION

This appendix contains the original Part 1 sampling plan for the Hydrogeologic Investigation - Work Plan Task 11.

The decision to conduct any or part of these sampling activities has been postponed. The information is presented here should the sampling plan be amended to include some or all of these activities.

The drilling program and the subsequent construction of monitoring wells will be done (1) to provide hydrogeologic data regarding the movement of water in the unsaturated and saturated zones, and (2) to provide soil and groundwater samples for chemical analysis. Five onsite borings, all of which will be converted to wells, will be drilled. The well locations are shown in Figure F-1.

The central well location (Grid ID No. 24E) is selected since it is in the center of an onsite pond identified from aerial photograph review. The other four well locations, 14A, 21B, 26B, and 46D, are spaced for maximum separation and placement to identify if pollutants are migrating across the site boundaries. Split spoon samples will be taken continuously from the ground surface to a depth of 20 feet to determine soil lithology, and at 5-ft intervals thereafter. Samples obtained at the following six depths of all wells will be analyzed in accordance with the onsite soil boring procedures: 0-6 in. (ground surface), 2 ft, 4 ft, 6 ft, 8 ft, and 10 ft.

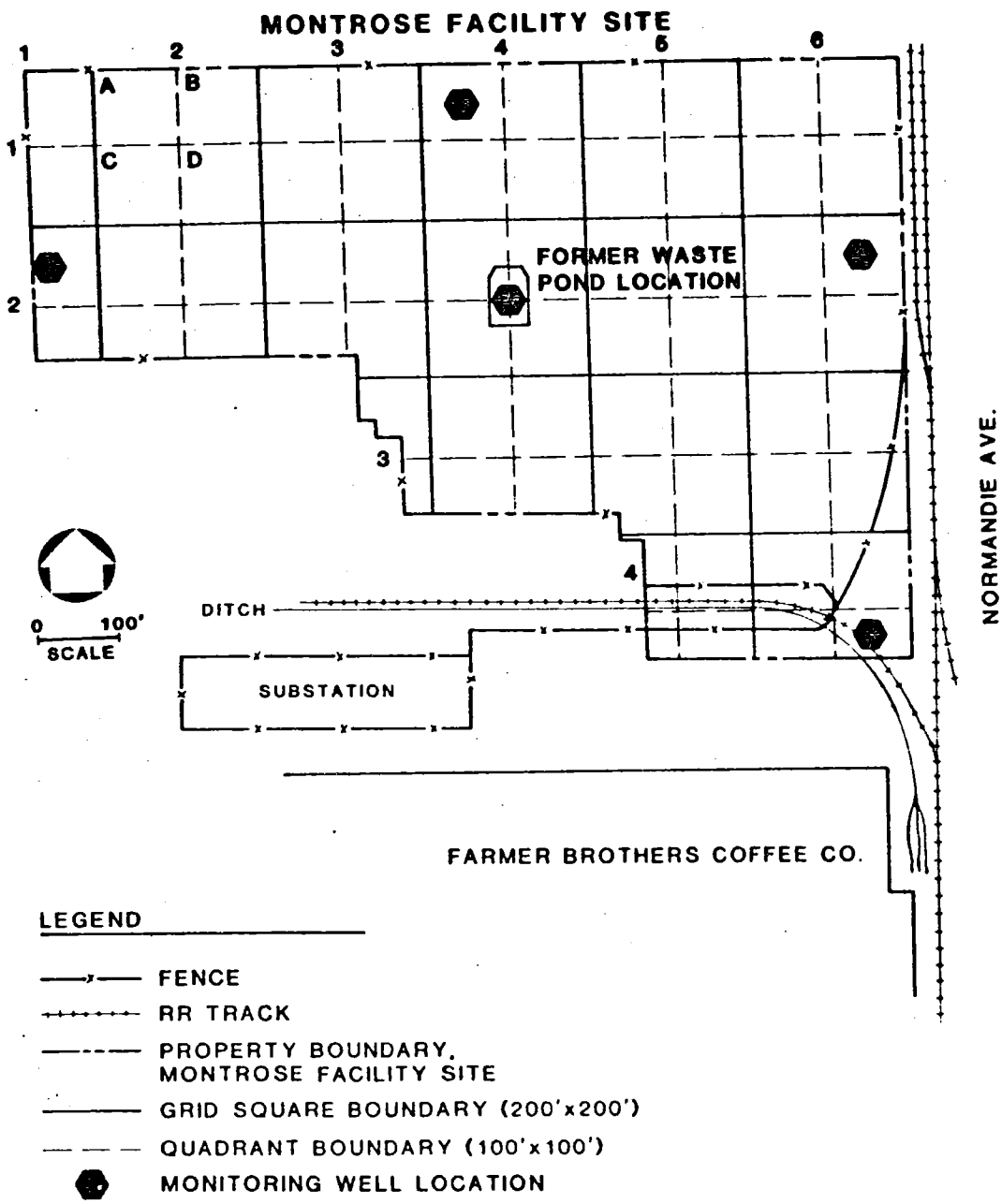

FIGURE F-1. ONSITE MONITORING WELL LOCATIONS

Because boring 24E is located at the location of a former waste pond, the soils will be sampled continuously for 30 feet to determine the soil lithology and at 5-ft intervals thereafter. Samples obtained at the followng 11 depths will be analyzed in accordance with the onsite soil boring procedures: 0-6 in. (ground surface), 2 ft, 4 ft, 6 ft, 8 ft, 10 ft, 12 ft, 14 ft, 16 ft, 18 ft, and 20 ft. These samples will be analyzed for the same priority pollutants and TOC as the onsite soil boring samples. Additional samples for analysis will be selected at 15-ft intervals from the remainder of all well borings starting at the 25-ft depth for all wells and analyzed for priority pollutants.

Portable organic vapor analysis equipment will be used to scan all soil samples in the field as they are collected. Any soil samples that give a positive HNu indication above background levels will be considered for USEPA Priority Pollutant analysis. In addition, in all five borings, one soil sample for each stratum that is saturated will be designated for analysis of Priority Pollutants. Any samples which visually appear to show characteristics of contaminated soil will also be analyzed for all USEPA Priority Pollutants. Samples collected but not indicated for analysis will be stored for a period of 3 months. Table F-1 summarizes all soil sampling to be conducted during the soil boring and hydrogeologic investigations in Part 1 of the Remedial Investigation. Appendix C contains the NCLP forms to be submitted for all samples being taken in the Part 1 investigation.

Table F-1 REMEDIAL INVESTIGATION PART 1 SOIL SAMPLING SUMMARY

Location Grid No.	Total No. samples 6-in. tubes	No. of samples for analysis - ft depth			Type of analysis			
		0-10[a]	10-20	20-100[b]	Priority pollutant[c]	TOC	Dioxin	Grain size
11D	20	6	--	--	6	6	--	--
12D	20	6	--	--	6	6	--	--
13D	20	6	--	--	6	6	--	--
14A	102	6	--	6	12	6	--	--
14D	20	6	--	--	6	6	--	--
15D	20	6	--	--	6	6	--	--
16D	20	6	--	--	6	6	--	--
21B	102	6	--	6	12	6	--	--
21D	20	6	--	--	6	6	--	--
22D	20	6	--	--	6	6	--	--
23D	20	6	--	--	6	6	--	--
24D	20	6	--	--	6	6	5[d]	--
24E	102	6	5[a]	5	16	6	--	--
25D	20	6	--	--	6	6	--	--
26B	102	6	--	6	12	6	--	--
26D	20	6	--	--	6	6	--	--
33D	20	6	--	--	6	6	--	--
34D	20	6	--	--	6	6	--	--
35D	20	6	--	--	6	6	--	--
36D	20	6	--	--	6	6	--	--
45D	20	6	--	--	6	6	--	--
46D	102	6	--	6	12	6	--	--
Soil types[e]	--	6	--	--	6	6	--	6
Duplicates	--	23	1	3	27	24	--	--
Background	2	2	--	--	2	2	--	--
Total	852	163	6	37	201	164	5	6

a. Two-ft interval.
b. Fifteen-ft interval.
c. Priority Pollutant consists of volatile and semivolatile organics, pesticides, metals, and spot cyanide analyses.
d. Up to five samples may be submitted for Dioxin analysis if MCB levels are greater than 1 ppb.
e. A minimum of six different soil types is assumed.

Duplicates are included for 10% of the samples taken in a day or one per day minimum. Six samples will be taken at least 10 miles from the site in direction(s) least often downwind of the Montrose site as determined from nearby airport wind roses and air monitoring data from grading activities should those data become available. These six samples will be used to determine possible background DDT levels.

Large-diameter hollow stem auger techniques will be used to advance the boreholes. One of the critical aspects of the drilling operations is preventing the downward movement of contaminated surface soil during drilling or monitoring well construction. The use of a 20-foot length of large diameter casing at the surface, and steam cleaning of the drill stem and bit after penetrating the upper soils, is proposed as the method of mitigating this potential problem.

All borings will be logged by a qualified geologist or geotechnical engineer. Field observations to be recorded include visual soil classifications, color, moisture content, presence of foreign materials, sample recovery, and any problems encountered while drilling or sampling. All samples will be collected, handled, preserved, and stored for analysis according to criteria specified in the Analytical Procedures Section of this plan and the Quality Assurance Project Plan.

Monitoring Well Construction. Monitoring well construction permits will be obtained from the Los Angeles County Flood Control District. Monitoring well construction and development will comply with requirements of the California Regional WQCB, Los Angeles Region (Underground Tank Investigation Program, November 1983). A typical detail of monitoring well construction is shown in Figure F-2.

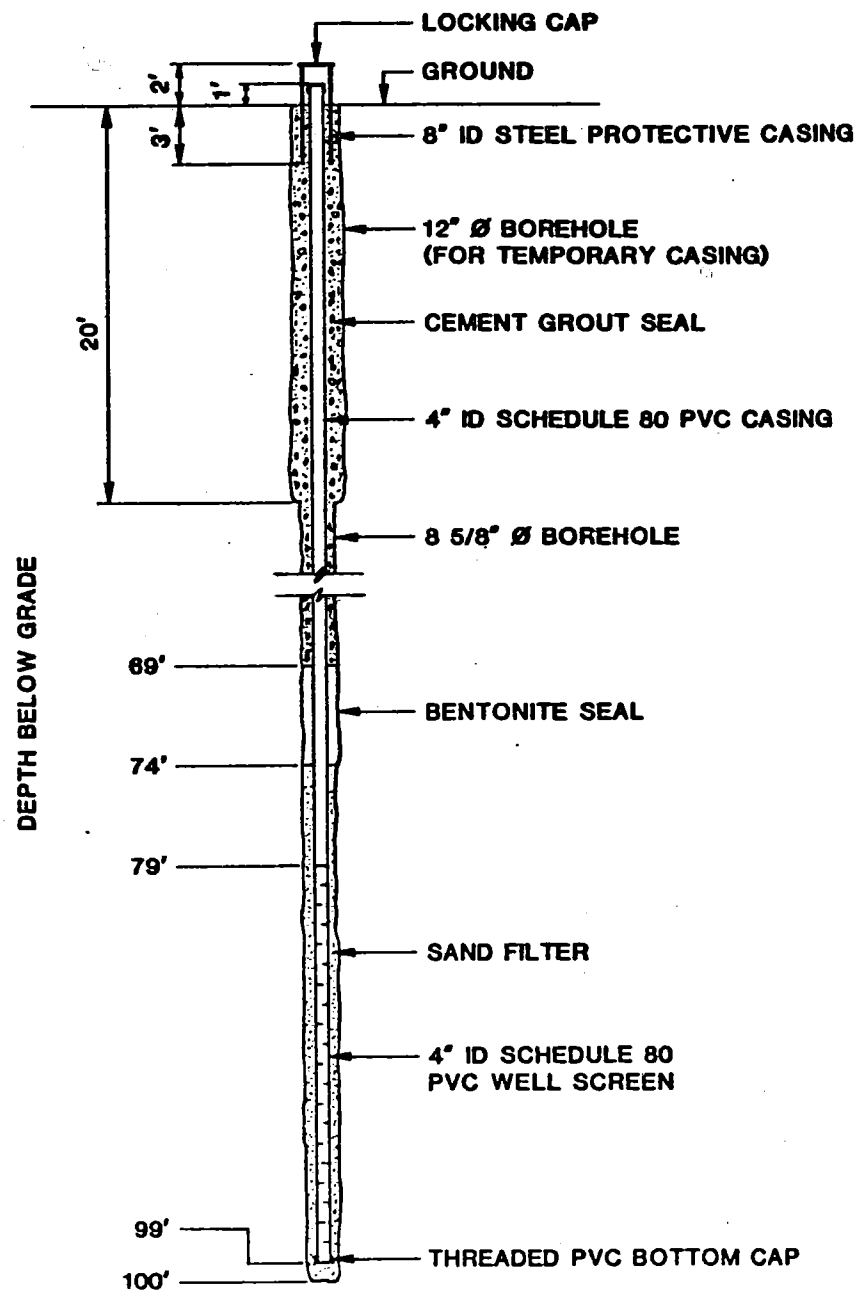

FIGURE F-2.
TYPICAL CONSTRUCTION DETAIL OF MONITORING WELLS

Monitoring well screens and riser pipe will be of 4-inch nominal diameter and constructed of Schedule 80 PVC. Well screens will be 10 to 20 feet long, and all sections of pipe will have threaded connections. The location of the screened intervals will be determined during the drilling program. The technical specifications for the drilling subcontract work are included in Appendix D.

The monitoring wells will be developed to remove the fine-grained aquifer materials from the vicinity of the well screen so that clear water samples can be collected. Pumping or bailing are the only approved methods for well development.

Monitoring Well Installation and Soil Sample Procedures

Mobilization. The drilling subcontractor selected by competitive bid must be capable of supplying a California split-spoon sampler and a 140-lb hammer for driving the sampler into the ground. Full technical specifications of required equipment are located in Appendix D.

Brass sampling tubes, aluminum foil, teflon caps, and electrical tape will be provided by Metcalf & Eddy. Other equipment required includes:

- Health and safety materials - see Health & Safety Plan checklist
- Century HNu
- Field notebooks (three)
- Drilling log, chain-of-custody, and sample label forms
- Sampling containers as specified by NCLP
- Markers and other labeling items

- Plastic bags
- Office trailer with desks (two) and chairs (four)
- Spray paint cans
- Disposal drums, new, 55-gal capacity (45 minimum)
- pH meter
- Electrical conductivity temperature probe by Hydrolab
- Electrical water level tape
- Centrifugal or bladder pump
- 25-ft length of discharge hose
- Polyvinyl sheet
- Camera and film
- Decontamination equipment - see Health & Safety Plan checklist

Prior to going onsite, the team leader will review and expand upon this list as required.

Cleaning. Drill rig shall have been steam cleaned prior to being brought onsite. Each length of hollow stem auger shall be cleaned by pressurized steam before commencing to drill at each soil boring site. Sampling tubes will be cleaned prior to use by TSP detergent wash, deionized water rinse, and certified organic-free water rinse.

Onsite Activities. Onsite activities will include:

- Review project objectives with all personnel and identify well site to be drilled each day.
- Review health an safety procedures with all personnel.
- Make background HNu measurements onsite every 3 hours. Record observations at at least three locations around the site: locations to be determined in field by Team Leader.

- Make daily record of weather conditions and site characteristics
- Place polyvinyl sheet down around well hole location and secure.
- Assemble sampler with brass tubes and drive it into the ground. Continuous sampling of 20 or 30 feet of soil will be performed at each well location. Record the blow count on the drilling log for each 6-in. interval.
- Retrieve the sample, open the spoon, remove samples, and decontaminate spoon prior to reuse.
- Take HNu measurements of each sample tube. Record reading and make visual observations as required in section Sample Types and Location. Note any difficulties in sampling including drilling behavior. Classify soils according to Unified Soil Classification System.
- Cap ends of brass tubes with aluminum foil and teflon end cap. Secure cap and foil with electrical tape.
- Label each tube and place in plastic bag. Mark top and bottom of sample tubes.
- Label each plastic bag.
- Complete chain-of-custody forms, seals, and traffic reports. See QAPP.
- Take split-spoon samples every 5 ft after 20- or 30-ft continuous sampling zone until engineer or geologist indicates drilling can stop (approximately 100 ft).
- Package groups of samples and ship via Federal Express to designated NCLP laboratory daily. Follow procedures for packing low and medium concentration samples as noted in QAPP.
- Clean split-spoon sampler by TSP detergent wash, water rinse, and deionized water rinse.
- Pressurize steam clean downhole drilling equipment.
- Remove waste soil materials and polyvinyl sheet.
- Place waste soil material from the first 5 and second 5 feet of drilling in separate drums from waste soil materials from below 10 feet of ground. Place waste soils from different wells in the same drum. Place polyvinyl sheet in the upper 5-ft interval designated drums. Label and handle all waste soil and water drums in accordance with all state, federal, and local regulations and as specified in the Technical Specifications, Appendix D.

- At the 20-ft depth, remove the hollow stem auger and install a 12-in. diameter protective steel casing.

- Clean out the cased hole to the 20-ft depth; then continue sampling as previously described.

- Upon reaching 100 feet or the depth designated by the engineer or geologist, construct monitoring well. Place a 1-ft thick layer of clean filter sand in the bottom of the hole. Install closed bottom cleaned PVC well screen and PVC casing on the top of the sand filter layer.

  The screen and casing sections shall be of threaded joint assembly. Remove hollow stem auger as annulus between screen and borehole is filled with clean filter sand to height specified. Place a 5-ft thick layer of bentonite pellets on top of the filter sand. Place cement grout from the top of the bentonite layer to the ground surface in one continuous operation using a tremie pipe while removing temporary protctive casing. Install protective steel casing as specified before grout sets. No further work on the monitoring well shall be performed until the grout sets (24 hours).

- Develop the monitoring well by either bailing or using a submersible pump. Steam clean all equipment. Pump each well for a period not to exceed 4 hours and at a rate not to exceed 2 gpm. Pump discharge to 55-gal drums. Keep water from each well separate.

- Make the following measurements during well development:

  - Water level prior to installing development equipment

  - At start of pumping and once each hour of development, measurements of pH, temperature, and electrical conductance

  - Immediately on completion of development, pumping measurement of water level recovery during a 1-hr period. Record time and water level data.